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A Polyperiod Analysis of Profit Maximizing Strategies With Beef Cow Herds Under Variable Weather Conditions in North Central South Dakota

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A POLYPERIOD ANALYSIS OF PROFIT MAXIMIZING STRATEGIES WITH BEEF COW HERDS UNDER VARIABLE WEATHER CONDITIONS IN NORTH CENTRAL SOUTH DAKOTA

by

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This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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SUMMARY AND CONCLUSIONS

This study used three polyperiod linear programming models to analyze the effects of several management strategies on the organization of a hypothetical 2,560 acre ranch in North Central South Dakota. Two models including three-year drought periods and one model with no drought were constructed. In building the two drought models, several assumptions concerning drought assistance to cattle producers were made and incorporated into the models.

The major findings of the study were as follows:

1. A land use program using 620 acres of cropland and 1,800 acres of pasture land resulted in greater total profit than a land use program with 2,420 acres of pasture land. This was true in all models.

2. The beef cow herd exhibited much greater variability during ten-year periods including drought than with a ten-year period with no drought.

3. Supplementary hog activities were selected at their maximum allowable scale with every strategy which included them over a ten-year period with only two exceptions. Those exceptions were both with a strategy which attempted to maximize profits in the worst year of a drought. In both instances 115 pigs were farrowed and sold in the first year of a three-year drought period.

4. The strategy with no supplementary hog and sheep activities and the strategy with no cropland required the greatest amounts of capital borrowing with every model. The same two strategies also provided the least total profit over a ten-year period with every model.

5. The strategy with supplementary hog and sheep activities, 1,800 acres of pasture land and 620 acres of cropland produced the greatest total profit over a ten-year period with every model.

6. Annual forage costs per cow unit equal to or less than $103.60 were required to maintain a beef cow herd during drought when the drought occurred in the first three years of a ten-year period. Annual forage costs per cow unit equal to or less than $106.90 were required when a drought occured in the fourth, fifth, and sixth years of a ten-year period.

7. Annual forage costs per cow unit greater than $121.60 resulted in the elimination of the beef cow herd during drought with a model having drought in the first three years. Annual forage costs per cow unit greater than $154.90 resulted in the elimination of the beef cow herd during a drought in the fourth, fifth and sixth years.

8. Following a period of drought it took two to three years to recover an annual cash balance which was greater than zero in dollar value.

9. A drought of the severity assumed in this study cost the ranch operator employing a diversified crop and livestock program at least $67,345.15.

Four major conclusions were drawn from the findings of this study. These conclusions were subject to the restrictions and assumptions imposed on the models. The conclusions were as follows:

1. A ranch operator should plan his operation with the expectation of drought. The ranch organization should be planned to include activities which provide income regardless of weather conditions. Although a ranch operator cannot know when a drought will occur, planning the organization with the expectation of drought and building up reserves of capital to provide additional cash flow when needed is important for the survival of the ranch firm.

2. A land use program which includes cropland is preferable to a program which consists of all pasture land.

3. A diversified livestock program helped maintain cash flow, lowered capital borrowing and increased annual profits during a drought.

4. Two or three years will be required to recover an annual cash balance greater than zero in dollar value if price conditions are favorable.

CHAPTER I

INTRODUCTION

Statement of the Problem

Low annual amounts of rainfall in combination with high temperatures and strong winds have periodically resulted in drought conditions for ranchers in North Central South Dakota. How to adjust ranch organization to meet unfavorable weather conditions is a major problem for ranchers in the area. Appropriate management strategies to reduce the economic effects of a drought can mean the difference between survival and demise of the operation.

Objectives

The objectives of the study were:

1. To identify management strategies which might be used by South Dakota ranchers to cope with unfavorable weather conditions.
2. To determine the management strategies which maximize profits over a ten-year period under different variable weather conditions.

Nature and Scope of the Study

To evaluate the different management strategies, polyperiod linear programming was used with profits as the objective function. The management strategy which produced

the greatest profits[1] was considered to be the best strategy under the prescribed circumstances. The analysis was applied to a hypothetical ranch of 2,560 acres in North Central South Dakota. For the purposes of the study a ranch was defined as an establishment with a beef cow herd as its primary livestock enterprise. Some cropland was assumed to be available for grain and forage production. Ranch size was determined by the number of acres necessary to adequately support[2] a ranch family with a beef cow herd as the major livestock enterprise under average yield conditions for the area.

The study was limited to an analysis of six alternative management strategies. Variable weather conditions were built into three ten-year models and the management strategies were analyzed with each model. Model I had drought in the first, second and third years. Model II had drought in the fourth, fifth and sixth years. Model III had no drought. Details of the management strategies and models are presented in Chapter III.

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[1]It must be noted that ranchers are not necessarily exclusively profit maximizers. Goals that may conflict with profit maximization are often important on ranchers' decision-making.

[2]Adequate support of a farm family included living expenses of $7,200 per year escalated at 6% per year over the ten-year period.

Method and Procedure

Three polyperiod linear programming models were used to select the most profitable combination of enterprises over a ten-year period for each of the management strategies evaluated. Six management strategies were evaluated with Models I and II. Three management strategies were evaluated with Model III.

The models included the following ranch activities from which to select the most profitable combination of enterprises.

1) six crop activities
2) seven livestock activities
3) five pasture activities
4) one capital borrowing activity
5) several separate feed and livestock purchase and sale activities
6) one rent pasture activity in the third drought year of Models I and II

Land, labor and capital restrictions were placed on each model. The cash flow was measured for each of the strategies. Parametric programming was used to determine whether to sell or maintain the beef cow herd during the drought periods of Models I and II.

Source of Data

Research publications of the Economics Department at

South Dakota State University provided much of the information used in developing activity budgets [1]. Information on farm prices and indices was obtained from the South Dakota Crop and Livestock Reporting Service and the United States Department of Agriculture's Market News publication. The data concerning the amount of AUM's produced by native, short season and full season pasture programs was obtained from pasture research conducted by the Plant Science Department at South Dakota State University and completed at the Pasture Research Center near Norbeck, South Dakota.

CHAPTER II

REVIEW OF LITERATURE

Gors [2] used linear programming to determine optimum farm organizations for selected sizes of dryland and partially irrigated farms in central Sully County, South Dakota. Gors compared profit maximizing organizations of 640; 1,280 and 2,560 acre dryland farms with 560; 1,080 and 2,240 acre partially irrigated farms. The author concluded that partially irrigated farms were more profitable than dryland farms for every farm size group.

Allen [3] used linear programming to determine alternative ranch plans for maximizing net returns under varied capital and efficiency levels and optimum adjustments in ranch organization during pasture renovation. Allen analyzed a typical[1] 1,600 acre ranch organization in Central South Dakota. Ranch organizations resulting from differing combinations of efficiency (low, medium, high) and capital levels (unlimited, $20,000; $15,000; $10,000; $5,000) were compared. Among other things, study results indicated that crop production had priority on the use of capital at all levels of efficiency.

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[1] A typical 1,600 ranch organization was defined as the average ranch size in Hyde County, South Dakota in 1965.

Boykin [4] compared average range feed condition with drought range feed condition for a typical ranch operation[2] in the western section of the Southern Plains (all of Texas and Oklahoma). He evaluated the effects of drought on management decisions, costs and income for a typical ranch operation. Boykin found that net cash income, net ranch earnings, net ranch income and the rate of return on investment were much lower for drought range feed condition than average range feed condition. A 25% decrease in range feed condition resulted in a 45.92% decrease in net ranch income.

Boykin, Gray and Caton [5] performed case studies of four ranches in New Mexico for the period 1948-1959. Strategies of each of the ranch operators and the effects of their decisions on the operation of their ranches were examined. The period 1948-1959 was inclusive of the 1951-1956 drought. A conclusion of the authors was that, because of rising costs during the drought, the ranches surveyed would have increased ranch incomes had they liquidated part of their beef cow herds earlier in the drought.

Afzal, McCoy and Orazem [6] developed three inventory models to identify optimum feed reserves under drought conditions. In Model I optimum feed reserves were determined when the sale of some cattle during drought was permitted.

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[2] A typical ranch operation was developed from previous studies in Eastern New Mexico.

In Model II optimum feed reserves were determined when additional feed purchases during drought were permitted. In Model III optimum feed reserves were determined when cattle were fed only survival rations and additional feed purchases during drought were permitted. Expected total net revenue and optimum feed reserves were determined for various stocking rates and percentage increases in beef cattle prices. Results from Model I indicated that:

> The quantity of feed reserves is relatively more responsive to the rate of increase in beef-cattle prices at light and moderate stocking rates than at a heavy stocking rate. A heavy stocking rate is associated with a smaller quantity of optimal feed reserves than is a moderate or light stocking rate . . . . Expected total net revenue for a given stocking rate at optimal levels of feed reserves is relatively unresponsive to the rate of drought-induced rise in the price of an animal unit.

The study concluded that inventory analysis could be used to determine optimal quantities of feed reserves for beef-cattle production under unstable climatic conditions.

Loftsgard and Heady [7] discussed techniques for applying dynamic linear programming to individual farm operations. They examined methods of transferring capital between years in a polyperiod linear programming model. They stressed the importance of projecting living and other expenses of a case firm over a planning period. It was concluded that dynamic linear programming could be a valuable tool in assisting farm operators develop farm and home plans. Some technical assistance would be required to assist farm

operators develop farm and home plans.

Helmers and Lentz [8] used polyperiod linear programming to research the nature of capital accumulation for Nebraska grain-livestock farms over a twenty-year period. They analyzed various investment strategies seeking to maximize discounted net returns of a hypothetical Eastern Nebraska grain-livestock farm over a twenty-year period. Several models were constructed with varied price and resource restriction assumptions. Study findings indicated that of all resource changes examined a change in labor availability affected growth strategy most, and that cyclical price variations resulted in continued investment in specialized swine facilities rather than investment in flexible livestock facilities.

CHAPTER III

THE PROGRAMMING MODELS

The Polyperiod Models

Polyperiod linear programming is a particular type of linear programming which can include more than one period of time. The extension of linear programming to the polyperiod model involves maximizing a linear objective function subject to a set of resource/activity relationships for each of several time periods and subject to the requirement that activity levels are non-negative. The polyperiod model can be internally dynamic in that resources and products are transferred from period to period. Externally, the polyperiod model is static because coefficients and the relationships between them do not change, are known with certainty and no outside forces affect the model.

Three polyperiod models which reflected different variable weather conditions over a ten-year period were constructed. The weather conditions were: Model I -- a designed drought pattern in the first three years of a ten-year period; Model II -- a designed drought pattern in the fourth, fifth and sixth years of a ten-year period; Model III -- a ten-year period with no drought. Each of the models was based on 1966-1975 Faulk County, South Dakota prices and yields.

Three major sets of data necessary to build the models

were production costs, product prices and production yields.

Production costs were based on current available data provided by the Economics Department at South Dakota State University. Costs were estimated for each ranch activity based on 1975 costs and deflated backward through time for the years 1966-1975. The cost deflator used was [9] :

$$\frac{\text{Index of Prices Paid for Production Items in a Year, 1966-1975}}{\text{Index of Prices Paid for Production Items in 1975}}$$

Crop prices were taken from Faulk County, South Dakota. Average South Dakota crop prices for each year, 1966-1975, were used [10] . Monthly livestock prices were taken from the United States Department of Agriculture's Market News [11] publication for each year, 1966-1975. Production costs and product prices were virtually the same in all models. The only exception was the production costs of crop and pasture activities in the second and third years of drought which were affected by government assistance programs and the lack of harvest operations.

In Model I crop and pasture yields were adjusted to reflect drought conditions in the first three years of the ten-year period. In Model II crop and pasture yields were adjusted to reflect drought conditions in the fourth, fifth and sixth years of the ten-year period. In Model III actual Faulk County, South Dakota average yields for 1966-1975 were used. (For details of the production yields, product prices and production costs used in each model, see Appendix A.)

General Assumptions

It was assumed that the ranch operator had perfect knowledge of all production costs and yields and product prices and would attempt to maximize profits subject to the restrictions imposed by each model and strategy. The ranch was assumed to include 2,560 acres of land. Buildings and facilities with a value at the beginning of the ten-year period of $30,000 were assumed to be available. The buildings and facilities were assumed to be 50% depreciated. Land was valued at $100 per acre at the beginning of the ten-year period and a $200,000 note amortized over thirty years was held against the ranch property.

Living expenses were set at $7,200 per year in the beginning of the ten-year period and inflated by 6% per year over the ten-year period. Annual expenses for maintenance of buildings and facilities, taxes, insurance and repairs were inflated at a 3% rate per year. Machinery costs were included in the production costs for each crop activity.

Hogs and sheep were included as supplementary activities with several management strategies. When included, the hog activity was limited to fifteen sows producing 240 pigs annually with a two-litter system. This limitation was imposed because of space requirements.

Four government assistance programs were assumed to

be available during drought and were incorporated into Models I and II. These programs were: capital borrowing to maintain pre-drought operation levels would be possible through the Farmers Home Administration; government crop payments would be available for corn, barley and wheat when yields were less than one-half of expected production; government assistance for livestock feed would reduce the cost of oats by one-half in the second and third drought years; government assistance for hay and silage transportation would offset any transportation costs in obtaining hay and silage. Government crop payments were based on one-third of the government loan rate multiplied by the expected production for that crop. (For details of government loan rates and expected corn, barley and wheat production, see Appendix A.)

It was assumed that the ranch operator did not consider government allotment programs when selecting his crop program.

It was assumed that buildings and facilities necessary for supplementary hog and sheep activities were available.

It was assumed that a rent pasture alternative would exist in the third year of the drought period to maintain the pre-drought size of the beef cow herd. The rent pasture alternative in Models I and II was included initially at the cost of $8.50 per AUM.

Alfalfa hay and tame pasture production require

establishment in the year previous to their use. In order to determine the level of forage production required under a profit maximizing production program, it was assumed that forage producing activities could be increased or decreased from year to year. Budgets for pasture and hay crops included establishment costs in the cost of production.

Management Strategies

Six alternative management strategies were evaluated under different weather conditions. These strategies were:

1. The Beef-Crop-Pasture Strategy. This strategy allowed various beef, crop and pasture activities in each year of the ten-year period. No hog or sheep activities were allowed.

2. The Diversification Strategy. This strategy allowed various beef, hog, sheep, crop and pasture activities in each year of the ten-year period.

3. The Diversification Strategy Adjusted to Maintain the Beef Cow Herd During Drought. The diversification strategy was adjusted by lowering the cost of the rent pasture activity. Parametric programming was used to identify the annual forage cost per cow unit for maintaining the beef cow herd during drought.

4. The Diversification Strategy Adjusted to Sell the Beef Cow Herd During Drought. The diversification strategy was adjusted by raising the cost of the rent pasture activity. Parametric programming was used to identify the annual forage cost per cow unit to sell the beef cow herd during drought.

5. The Diversification Strategy with Profits Maximized in the Worst Year of Drought. The diversification strategy was adjusted by maximizing profits in the worst drought year rather than profits over the whole ten-year period.

6. The Beef-Hogs-Sheep-Pasture Strategy. This strategy allowed various beef, hog, sheep and pasture activities in each year of the ten-year period. No cropland activities were allowed.

Ranch Size and Land Use

The ranch size selected was intended to represent the number of acres necessary to adequately support a farm family with a beef cow herd as the primary livestock enterprise under average yield conditions in North Central South Dakota. The 2,560-acre ranch selected was divided into the following land uses:

Cropland -- 620 acres

Tame Pasture -- 300 acres

Native Pasture -- 1,500 acres

Non-Productive -- 140 acres

This land use program was selected because it represents a cropland/pasture land mixture which is common among ranches in that general area [12].

This land use program was followed for all strategies except the beef-hog-sheep-pasture strategy. The beef-hog-sheep-pasture strategy was divided into the following land uses:

Tame Pasture -- 300 acres

Native Pasture -- 2120 acres

Non-Productive -- 140 acres

Activities

The six major types of ranch activities were: crop activities, pasture activities, livestock activities, purchase and sale of livestock, purchase and sale of feed,

and borrowing capital. A description of how each ranch activity was used follows.

Crop Activities

Corn, oats and barley could be used as feed or sold for cash. Wheat and rye were included as cash crops and their production could not be transferred to other activities. Alfalfa hay was classified as a production activity and its production could only be transferred to alternative livestock activities.

Pasture Activities

All pasture production was used as feed for alternative livestock activities. Native pasture and prairie hay activities were alternative uses of native pasture land provided by the land use program. Short season and full season tame pasture land were alternative uses of tame pasture land provided by the land use program. A rent pasture activity was included in the third drought year of Models I and II.

Livestock Activities

A beef cow herd was the major beef production activity. It produced a 92% calf crop each year. The beef cow/calf program transferred .46 of a 425 pound steer and .28 of a 375 pound heifer per cow to other livestock or selling activities each year. The beef cow/calf program kept .18 of a 375 pound heifer per cow to replace beef cows eliminated

from the herd. The beef cow/calf program sold .15 of a cull cow and .02 of an unbred 600 pound heifer.

The steer and heifer calves produced could be transferred to one of three other beef production activities or sold. The other beef production activities were: a wintering steer activity from 425-600 pounds, a wintering heifer activity from 375-600 pounds, or a wintering and summering steer activity from 425-825 pounds.

The hog activities consisted of a fifteen sow farrowing unit producing two litters per sow. The feeder pigs produced could be sold at 40 pounds or fattened and sold as 225 pound finished hogs.

The sheep production activity was a flock of ewes producing a 120% crop of July fat lambs. The activity included the sale of the lamb crop.

Purchase and Sale of Livestock

Two selling activities for the sale of 425 pound steers and 375 pound heifers were included as alternatives for the beef calf crop transferred out of the beef cow herd. Two selling activities for the sale of feeder pigs and aged sows were included as alternatives to the sow/two-litter system.

Beef cows could be bought or sold on a unit basis. A beef cow unit included one beef cow, .04 of a bull and .16 of a replacement heifer.

Purchase and Sale of Feed

Corn, oats and barley could be bought or sold to provide necessary livestock feed or cash. Prairie hay and alfalfa hay could be purchased as necessary livestock feed.

Borrowed Capital

Borrowed capital was included as an activity in each year of the ten-year period. Capital borrowing was required when the cash flow in a particular year resulted in greater accumulated cash disbursements than cash receipts. Interest rates were based on a weighted average of interest rates charged for non-real estate loans from commercial banks and Production Credit Associations for the years 1966-1975.

Restrictions Imposed

Land

Land consisted of 2,420 acres available for crop and livestock production. Except for the strategy which allowed no cropland, 1,500 acres of that total were allocated to native pasture, 300 acres were allocated to tame pasture and 620 acres were allocated to cropland. With the beef-hogs-sheep-pasture strategy 2,120 acres were allocated to native pasture and 300 acres were allocated to tame pasture. Cropland acres were required to be used with every strategy which included it. Pasture land was allowed to go into slack with every strategy.

Labor

Labor was divided into six bi-monthly time periods of 1,000 hours each in every year. This labor was available to the ranch firm at no cost to the operator. No hired labor was allowed in any of the models.

Capital

The equity capital at the beginning of the ten-year period was assumed to include a line of machinery to perform all activities and the livestock investment necessary for all livestock activities selected in the first year of the ten-year period. Cash flow restrictions required that annual ranch cash receipts equal or surpass annual cash disbursements in every year of the ten-year period. Sufficient capital borrowing was permitted to guarantee that result. Annual capital borrowing had to be repaid from the following year's receipts or renewed at prevailing interest rates. Beef cattle investment capital could be liquidated to add to cash flow.

Activity Budgets

Livestock activity budgets were derived from research by Allen and Jibben [13]. Crop activity budgets were based on research by Allen [14] and Derscheid, Aanderud and Allen [15]. Pasture costs were calculated with the use of a computer program developed by Allen [16]. (For details of these budgets see Appendix A.)

Cash Receipts

Cash receipts were the total ranch sales from all livestock and crop activities selected in each year.

Production Expenses

Production expenses included all feed, medicine, equipment and machinery repairs, and marketing costs for livestock activities. For crop activities they included all costs for machinery operation and ownership, seed, fertilizer, pesticides, herbicides, insurance and general overhead. For pasture activities they included all costs for machinery operation and ownership, chemicals, custom hired labor, and seed.

Fixed Expenses

Fixed expenses included an annual allowance for living expenses for the farm family, an annual land payment of $14,520, and other ranch expenses for building depreciation, building and land taxes, building insurance and repairs. Fixed expenses were subtracted from annual ranch cash receipts in a lump sum. Interest was charged at an annual rate per dollar of capital borrowed.

Cash Flow

Annual cash flow represented the sum of cash receipts and borrowing minus all production and fixed expenses and loan repayments. The annual cash flow was required to be

equal to or greater than zero in dollar value. It is important to recognize that cash receipts from the liquidation of cattle breeding stock would add to cash flow and provide operating capital. This in turn would reduce profits, since profits were generated only through a production activity.

Table 3-1 presents the cash flow workings for the diversification strategy with Model I. It is presented here to illustrate the method used in compiling a cash flow statement. Hereafter the results of the cash flow are discussed only in terms of the need for capital borrowing.

Ranch Profits

For the purposes of this study profit was defined as total cash income from production activities less all production and fixed expenses. The objective of the study was to select a combination of activities that would maximize profits for the farm family over a ten-year period. No analysis was made of returns to management, land, labor or capital. Also, changes in net worth were not compiled within the scope of this study.

A net profit of zero meant that all cash obligations had been met. A positive net profit represented returns to the owner's resources over and above what was required to keep them employed in that particular set of activities.

Table 3-1. The Cash Flow Statement for the Diversification Strategy with Model I

Item	Year 1	Year 2	Year 3	Year 4	Year 5
Returns Over Costs for Cash Crops	$ 2,934.27	$ 6,323.17	$ 0.0	$16,149.89	$ 5,888.96
Returns Over Costs for Livestock	33,462.26	37,528.67	36,159.51	39,235.89	43,959.90
Capital Borrowing	8,572.99	15,053.29	13,774.32	51,669.69	56,132.18
Total Inflow	44,969.52	58,905.13	49,933.83	107,055.47	105,981.04
Loan Payments	0.0	8,572.99	6,480.29	7,294.03	44,375.67
Fixed Expenses	29,240.00	29.897.60	30,587.89	31,312.62	32,073.66
Other Cash Disbursements	15,730.51	20,434.54	12,865.66	68,448.82	29,531.72
Total Outflow	44,970.51	58,905.13	49,933.84	107,055.47	105,981.05
Annual Cash Balance[1]	0.0	0.0	0.0	0.0	0.0

Item	Year 6	Year 7	Year 8	Year 9	Year 10
Returns Over Costs for Cash Crops	$ 6,824.49	$24,244.30	$28,675.00	$14,536.80	$42,436.78
Returns Over Costs for Livestock	49,449.32	67,601.12	76,978.45	80,434.96	57,927.28
Capital Borrowing	10,456.14	0.0	0.0	0.0	0.0
Total Inflow	66,779.95	91,845.42	105,653.45	94,971.76	100,364.06
Loan Payments	11,756.51	0.0	0.0	0.0	0.0
Fixed Expenses	32,872.97	33,712.61	34,594.79	35,521.82	36,496.14
Other Cash Disbursements	22,150.47	27,254.68	27,598.07	31,629.32	62,050.30
Total Outflow	66,779.95	60,967.29	62,192.86	67,151.14	98,546.44
Annual Cash Balance	0.0	30,878.13	43,460.59	27,820.62	1,817.63

[1]Because of mathematical rounding of numbers, Total Inflow less Total Outflow may not equal Annual Cash Balance.

CHAPTER IV

RESULTS OF MODEL I

A summary of the ranch activities selected by each of the strategies evaluated with Model I and the total ranch profits associated with each of those strategies are presented in this chapter. Also, a brief comparison of the strategies and a presentation of the annual ranch profits and the optimum ranch organization of each strategy are included in this chapter.

The Beef-Crop-Pasture Strategy

Activities Selected

The beef cow herd consisted of 160 cows in the first year, dropped to 112 cows in the second year and was eliminated in the third year. It varied in size from 171 to 219 head in the fourth through the eighth year, dropped to 129 head in the ninth year, and recovered to 153 head in the tenth year.

Small grain and alfalfa hay dominated the crop program during the ten-year period. Sufficient feed quantities of alfalfa hay were grown in every year except in the third and eighth years. Corn was grown on 510 acres in the fourth year and 495 acres in the seventh year. No more than three crops were grown in one year.

The full amount of pasture acreage was used in every year except the third year when virtually no pasture yields existed because of drought. No rented pasture was purchased in the third year because the beef cow herd was eliminated.

Necessary livestock feed not grown was purchased and excess livestock feed grown was sold in every year with every strategy of Model I.

Capital borrowing was an important indicator of the financial status of the ranch firm. Capital borrowing was required when annual cash disbursements were greater than annual cash receipts. Capital borrowing was required in the first through the sixth year. Capital borrowing peaked at $77,380.59 in the fifth year.

Table 4-2 on page 37 presents the optimum ranch organization of each of the strategies evaluated with Model I.

Ranch Profits

The total ranch profit resulting from each strategy was the criterion used to evaluate the effectiveness of alternative management strategies. The strategy with the greatest total profit was considered to be the best strategy. The beef-crop-pasture strategy resulted in the largest total loss of all strategies evaluated with Model I. Total profit over the 10-year period was -$71,253.11. Annual profits ranged from a low of -$34,859.29 in the third year to a high of $27,708.44 in the eighth year. Table 4-1 on page 36

presents the annual and total profits for each of the strategies evaluated with Model I.

The Diversification Strategy

Activities Selected

The beef cow herd consisted of 161 cows in the first year, dropped to 111 head in the second year and fell to 31 head in the third year. It varied in size from 163 to 211 head in the fourth through the eighth year, dropped to 121 head in the ninth year, and recovered to 147 head in the tenth year.

In each year of the ten-year period, 240 pigs were farrowed, finished and sold as 225 pound hogs. In the fifth year, 11 ewes producing fat lambs were selected. In the ninth year, 177 ewes producing fat lambs were selected. Hogs and sheep were planned as supplementary-type enterprises which a ranch operator could get into and out of in a single year. Therefore, all breeding stock was sold each year and repurchased the following year if it was profitable to do so.

The crop program was similar to that selected with the beef-crop-pasture strategy. Corn was grown on 398 acres in the fourth year and 383 acres in the seventh year.

The full amount of pasture acreage was used in every year except the third year. In the third year 40 acres of full season pasture and 310 acres of rented pasture were

used to maintain the beef cow herd and the hogs.

Capital borrowing was required in the first through the sixth year. Capital borrowing peaked at $56,132.18 in the fifth year.

Ranch Profits

Total profit over the ten-year period for the diversification strategy was $8,881.22. Annual profits ranged from a low of -$30,606.52 in the third year to a high of $44,320.13 in the eighth year. Annual profits of less than zero in dollar value resulted in the first through the fifth year and again in the ninth year.

The Diversification Strategy Adjusted to Maintain the Beef Cow Herd During Drought

Activities Selected

The activities selected with this strategy differed from the diversification strategy only in the third, fourth and fifth years. In the third year 111 beef cows were maintained. To maintain the beef cow herd and 240 hogs, 1,072 acres of pasture were rented at a cost of $7.75 per acre. Much greater quantities of livestock feed were also purchased. Capital borrowing increased from $13,774.32 with the diversification strategy to $36,407.17 for this strategy in the third year.

In the fourth and fifth years the major difference

between this strategy and the diversification strategy was that smaller amounts of capital borrowing were required by this strategy to assist recovery from the drought.

Ranch Profits and Forage Costs

Because of the reduced cost of rented pasture required to maintain the beef cows, total profit for this strategy was greater than the total profit for the diversification strategy. The total profit over the ten-year period was $9,184.45. Annual profits were identical to the annual profits for the diversification strategy in every year except the third through the fifth year.

Total forage costs per cow unit to maintain the beef cow herd during drought were $103.60. Forage costs equal to or less than $103.60 per cow unit were required to maintain the entire beef cow herd during the drought.

The Diversification Strategy Adjusted to Sell The Beef Cow Herd During Drought

Activities Selected

The activities selected with this strategy differed from the diversification strategy only in the third, fourth and fifth years. In the third year the beef cow herd was sold. Only 71 acres of rented pasture were purchased to maintain the hogs. Only $5,205.97 worth of capital borrowing was required in the third year.

In the fourth and fifth years the major difference between this strategy and the diversification strategy was that more capital borrowing was required by this strategy to assist recovery from the drought after selling the cow herd.

Ranch Profits and Forage Costs

Because the cost of the rent pasture activity was raised to the amount where the beef cow herd was eliminated, total profit was less than total profit for the diversification strategy. Total profit over the ten-year period was $8,442.31. Annual profits were identical to annual profits for the diversification strategy in every year except the third through the fifth year.

The total forage cost per cow unit necessary to eliminate the beef cow herd during drought was $121.60. Forage costs greater than $121.60 per cow unit resulted in selling the entire beef cow herd during the drought. When forage costs per cow unit ranged between $103.60 and $121.60 the cow herd was reduced in size.

The Diversification Strategy with Profits Maximized in the Worst Year of Drought

Activities Selected

The beef cow herd consisted of 177 cows in the first year, dropped to 111 head in the second year and fell to five head in the third year. It varied in size from 163 to

211 head in the fourth through the eighth year, dropped to 121 head in the ninth year, and recovered to 147 head in the tenth year.

In the first year 115 pigs were farrowed and sold. In all other years 240 pigs were farrowed, finished and sold as 225 pound hogs. In the fifth year 11 ewes producing fat lambs were selected. In the ninth year 177 ewes producing fat lambs were selected.

The crop program was similar to that selected with the diversification strategy. Wheat was grown on 620 acres in the first year.

The pasture program was similar to that selected with the diversification strategy. In the third year 40 acres of full season pasture and 116 acres of rented pasture were used to maintain the beef cow herd and the hogs.

Capital borrowing was required in the first, second, fourth, fifth and sixth years. Capital borrowing peaked at $64,082.36 in the fifth year. No capital was borrowed in the third year. It should be noted that under this strategy the profit row in the third year became the objective function.

Ranch Profits

Total profit over the 10-year period for this strategy was $657.08. Annual profits ranged from a low of -$29,644.98 in the third year to a high of $44,320.13 in

the eighth year. Annual profits of more than zero in dollar value resulted in the sixth through the eighth year and the tenth year.

The Beef-Hogs-Sheep-Pasture Strategy

Activities Selected

The beef cow herd consisted of 218 cows in the first year, dropped to 149 head in the second year and fell to 56 head in the third year. Following the drought the cow herd was expanded again to peak numbers of 289 head in the eighth year. Unfavorable prices in the ninth year again caused the cow herd to be reduced to 161 head.

In each year of the ten-year period 240 pigs were farrowed, finished and sold as 225 pound hogs. In the fifth year seven ewes producing fat lambs were selected. In the ninth year 177 ewes producing fat lambs were selected.

The pasture acreage was completely used in every year except the third year. In the third year 40 acres of full season pasture and 551 acres of rented pasture were used to maintain the beef cows and the hogs.

Capital borrowing was required in the first, second and fourth through the sixth year. Capital borrowing peaked at $70,435.04 in the fifth year.

Ranch Profits

The total ranch profit over the ten-year period was

-$48,840.61 for this strategy. Annual profits ranged from a low of -$26,718.44 in the third year to a high of $25,898.73 in the eighth year. Only in the sixth through the eighth year were annual profits greater than zero in dollar value.

A Comparison of Strategies

Land and investment capital were primary resource limitations affecting the ranch organization. Labor was not generally a limiting factor of the organization of the ranch firm. Labor was completely used in only the September-October time period of the fourth and seventh years with all strategies evaluated with Model I except the beef-hogs-sheep-pasture strategy. Land was a limiting factor in that additional acres would generate profits for the ranch firm. Investment capital was restrictive in that additional buildings and facilities would permit more hog production.

The diversification strategy was considered to be the best long-range strategy for maximizing profits. This strategy resulted in greater profits than the beef-crop-pasture strategy because supplementary hog and sheep production could be added without adversely affecting the size of the beef cow herd. It also permitted more complete use of the available labor supply.

The strategy which maximized profits in the worst year of the drought resulted in lower total profits over

the ten-year period than the diversification strategy. Under the assumptions of this model profits were maximized in the third year of the drought primarily by reducing the need for borrowed capital. No money was borrowed in the worst year of drought under this strategy. However, more capital borrowing was necessary in the earlier years and also in the later years in order to build up the beef cow herd. A larger investment in beef cows previous to the drought provided sufficient cash flow when liquidated in the worst year of the drought. However, such a strategy did not permit adequate diversification in the years previous to the drought and resulted in lower profits in the long run.

The diversification strategy resulted in greater profits than the beef-hogs-sheep-pasture strategy primarily because the additional acres of native pasture, while permitting a larger herd of beef cows, could not adequately replace the loss of income from 620 acres of cropland.

The beef-crop-pasture strategy and the beef-hogs-sheep-pasture strategy were the most undesirable in terms of maximizing profits. With both strategies the ranch operator might be required to severely cut expenses annually in order to guarantee survival.

Table 4-1 presents the annual and total profits resulting from each strategy. Table 4-2 presents the

optimum ranch organization for each of the strategies. Within these tables the strategies are labelled in the following manner:

The beef-crop-pasture strategy	-1
The diversification strategy	-2
The diversification strategy with profits maximized in the worst year of drought	-3
The beef-hogs-sheep-pasture strategy	-4
The diversification strategy adjusted to maintain the beef cow herd during drought	-5A
The diversification strategy adjusted to sell the beef cow herd during drought	-5B

Table 4-1. Annual and Total Profits for Various Management Strategies with Model I

Profits	Strategies					
	(1)	(2)	(3)	(4)	(5A)	(5B)
First Year Profit	$-15,923.60	$- 9,158.53	$-17,415.88	$-10,152.03	$- 9,158.53	$- 9,158.53
Second Year Profit	-25,819.91	-20,563.63	-20,753.51	-17,592.95	-20,563.63	-20,563.63
Third Year Profit	-34,859.29	-30,606.52	-29,644.98	-26,718.44	-32,594.44	-30,145.05
Fourth Year Profit	-15,076.33	- 7,082.84	- 7,155.05	-7,860.84	- 6,892.61	- 7,180.38
Fifth Year Profit	- 9,890.95	- 3,880.01	- 4,546.23	- 7,446.44	- 1,779.08	- 4,702.84
Sixth Year Profit	546.09	3,410.57	3,410.57	2,234.68	3,410.57	3,410.57
Seventh Year Profit	16,694.14	21,603.00	21,603.00	14,689.36	21,603.00	21,603.00
Eighth Year Profit	27,708.44	44,320.13	44,320.13	25,898.73	44,320.13	44,320.13
Ninth Year Profit	- 8,371.43	- 1,370.55	- 1,370.55	-17,424.70	- 1,370.55	- 1,370.55
Tenth Year Profit	- 6,260.27	12,209.58	12,209.58	- 4,467.97	12,209.58	12,209.58
Total Profit	-71,253.11	8,881.22	657.08	-48,840.60	9,184.45	8,422.31

Table 4-2. Optimum Ranch Organization with Model I

Activities in Year 1	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa	acre	88.46	88.25			88.25	88.25
Rye	acre	531.54	531.75			531.75	531.75
Wheat				620.0			
Livestock activities							
Beef cow herd	head	160.01	161.53	177.62	218.2	161.53	161.53
Wintering heifers 375-600 lbs.	head	44.8	45.23	49.74	61.09	45.23	45.23
Wintering and Summering steers, 425-825 lbs.	head	38.15	14.38		14.38	14.38	14.38
Sell 425 lb. steers	head	35.46	59.92	81.71	85.99	59.92	59.92
Sow/2/litter system producing feeder pigs	head		240.0	115.2	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0		240.0	240.0	240.0
Sell feeder pigs				115.2			
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	149.87	219.21		219.21	219.21	219.21
Full season tame pasture	acre	150.13	80.79	300.0	80.79	80.79	80.79
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	678.45	3,684.88	1,041.15	3,925.18	3,684.88	3,684.88
Buy oats	bu.	1,267.29	1,729.31	1,622.82	2,178.16	1,729.31	1,729.31
Buy prairie hay	ton	243.85	233.62	248.68	312.96	233.62	233.62
Buy barley	bu.	305.18	115.05		115.05	115.05	115.05
Buy alfalfa hay	ton			90.62	116.47		
Sell aged sow	head		15.0	7.2	15.0	15.0	15.0
Borrow Capital							
Capital borrowing	dol.	14,905.56	8,572.99	16,302.42	9,502.98	8,572.99	8,572.99

Activities in Year 2	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa	acre	135.37	144.1	144.1		144.1	144.1
Barley	acre	484.63	475.9	475.9		475.9	475.9
Livestock Activities							
Beef cow herd	head	112.1	111.88	111.88	149.59	111.88	111.88
Wintering steers, 425-600 lbs.	head	34.92	51.46	51.46	68.81	51.46	51.46
Wintering heifers, 375-600 lbs.	head	31.39	31.33	31.33	41.88	31.33	31.33
Wintering and Summering steers, 425-825 lbs.	head	16.64					
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/s-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	190.83	259.68	259.68	259.68	259.68	259.68
Full season tame pasture	acre	109.17	40.32	40.32	40.32	40.32	40.32
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	475.3	3,474.35	3,474.35	3,634.25	3,474.35	3,474.35
Buy oats	bu.	877.83	1,336.06	1,336.06	1,634.73	1,336.06	1,336.06
Buy prairie hay	ton	183.75	183.38	183.38	245.2	183.38	183.38
Sell beef cow units	head	47.91	49.65	65.75	68.62	49.65	49.65
Sell barley	bu.	6,856.89	6,726.77	6,726.77		6,726.77	6,726.77
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa					94.82		
Buy barley					550.48		
Borrow Capital							
	dol.	26,301.18	15,053.29	17,731.53	8,506.04	15,053.29	15,053.29

Table 4-2. (continued)

Activities in Year 3	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Barley	acre	620.0	620.0	620.0		620.0	620.0
Livestock Activities							
Beef cow herd	head		31.49	5.99	56.87	111.88	
Wintering heifers, 375-600 lb.	head		8.82	1.68	15.92	31.33	
Sow/5-liter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/5-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Sell 425 lb. steers	head		14.48	2.76	26.16	51.46	
Pasture Activities							
Full season tame pasture	acre		40.32	40.32	40.32	40.32	40.32
Rent pasture	acre		310.66	116.97	551.31	1,072.67	71.44
Purchase and Sale of Crops and Livestock							
Sell beef cow units	head	112.1	80.39	105.88	92.71		111.88
Buy corn	bu.		3,133.5	3,025.41	3,241.15	3,474.35	3,000.0
Buy oats	bu.		699.36	497.46	900.44	1,336.06	450.0
Buy alfalfa	ton		20.18	7.48	32.82	60.21	4.5
Buy prairie hay	ton		44.08	8.39	79.62	156.63	
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Borrow Capital	dol.	14,120.	13,774.32			36,406.17	5,205.97

Activities in Year 4	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Corn	acre	510.3	398.1	398.1		398.1	398.1
Oats	acre	61.49	173.32	173.32		173.32	173.32
Alfalfa hay	acre	48.21	48.58	48.58		48.58	48.58
Livestock Activities							
Beef cow herd	head	171.58	163.99	163.99	222.73	163.99	163.99
Wintering and summering steers, 425-825 lbs.	head	78.93	75.44	75.44	91.72	75.44	75.44
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Wintering steers, 425-600 lbs.	head				10.73		
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	58.06	49.92	49.92		49.92	49.92
Full season tame pasture	acre	241.94	250.08	250.08	300.0	250.08	250.08
Purchase and Sale of Crops and Livestock							
Sell corn	bu.	19,558.53	12,197.91	12,197.91		12,197.91	12,197.91
Sell oats	bu	2,019.07	6,520.07	6,520.07		6,520.07	6,520.07
Buy prairie hay	ton	281.25	268.81	268.81	365.09	268.81	268.81
Buy barley	bu.	631.42	603.48	603.48	819.63	603.48	603.48
Buy beef cow units	head	171.58	132.51	158.0	165.85	52.11	163.99
Sell 375 lb. heifers	head	48.04	45.92	45.92	62.36	45.92	45.92
Buy corn	bu				3,445.45		
Buy oats	bu.				1,340.91		
Buy alfalfa	ton				117.15		
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Borrow Capital	dol.	66,150.12	51.669.69	52,595.53	56,197.12	49,230.85	52,920.32

Table 4-2. (continued)

Activities in Year 5	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	70.57	74.22	74.22		74.22	74.22
Rye	acre	549.43	545.78	545.78		545.78	545.78
Livestock Activities							
Beef cow herd	head	204.54	203.29	203.29	265.5	203.29	203.29
Wintering steers, 425-600 lbs.	head	94.09	93.52	93.52	122.13	93.52	93.52
Wintering heifers, 375-600 lbs.	head	57.27	56.92	56.92	74.34	56.92	56.92
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Ewe/lamb system producing July fat lambs	head		11.46	11.46	7.7	11.46	11.46
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	300.0	265.92	265.92	271.57	265.92	265.92
Full season tame pasture	acre		34.08	34.08	28.43	34.08	34.08
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	867.23	3,919.28	3,919.28	4,164.19	3,919.28	3,919.28
Buy oats	bu.	1,619.93	2,060.09	2,060.09	2,552.76	2,060.09	2,060.09
Buy prairie hay	ton	185.28	202.57	202.57	300.96	202.57	202.57
Buy barley	bu.	752.69	748.12	748.12	977.04	748.12	748.12
Buy beef cow units	head	32.96	39.3	39.3	42.77	39.3	39.3
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa hay					166.58		
Borrow Capital	dol.	77,380.59	56,132.18	64,082.36	70,435.04	31,061.49	65,951.16

Activities in Year 6	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	101.88	101.82				
Wheat	acre	518.12	518.18				
Livestock Activities							
Beef cow herd	head	219.35	211.76	211.76	289.21	211.76	211.76
Wintering heifers, 375-600 lbs.	head	61.42	59.29	59.29	80.98	59.29	59.29
Wintering and Summering steers, 425-825 lbs.	head	100.9	97.41	97.41	114.34	97.41	97.41
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Wintering steers, 425-600 lbs.	head				18.69		
Pasture Activities							
Native pasture	acre	1,500.00	1,500.00	1,500.00	2,120.00	1,500.00	1,500.00
Short season tame pasture	acre	48.78	42.17	42.17		42.17	42.17
Full season tame pasture	acre	251.22	257.83	257.83	300.0	257.83	257.83
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	930.04	3,897.8	3,897.8	4,226.25	3,897.8	3,897.8
Buy oats	bu.	1,737.24	2,127.13	2,127.13	2,740.54	2,127.13	2,127.13
Buy prairie hay	ton	359.56	347.11	347.11	474.07	347.11	347.11
Buy barley	bu.	807.2	779.27	779.27	1,064.29	779.27	779.27
Buy beef cow units	head	14.81	8.46	8.46	23.71	8.46	8.46
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa	ton				179.12		
Borrow Capital	dol.	17,187.46	10,456.14	10,456.14	19,655.86	10,456.14	10,456.14

Table 4-2. (continued

Activities in Year 7	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Corn	acre	495.28	383.11	383.11		383.11	383.11
Alfalfa hay	acre	61.88	62.29	62.29		62.29	62.29
Wheat	acre	62.84	174.6	174.6		174.6	174.6
Livestock Activities							
Beef cow herd	head	195.76	188.14	188.14	249.29	188.14	188.14
Wintering and Summering steers, 425-825 lbs.	head	90.05	86.55	86.55	114.67	86.55	86.55
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Summering heifers, 375-600 lbs.	head				69.8		
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	76.71	70.15	70.15	.41	70.15	70.15
Full season tame pasture	acre	223.29	229.85	229.85	229.59	229.85	229.85
Purchase and Sale of Crops and Livestock							
Sell corn	bu.	24,867.81	16,162.08	16,162.08		16,162.08	16,162.08
Buy oats	bu.	783.03	1,202.57	1,202.57	2,424.36	1,202.57	1,202.57
Buy prairie hay	ton	320.88	308.4	308.4	408.63	308.4	308.4
Buy barley	bu.	720.38	692.37	692.37	917.38	692.37	692.37
Sell 375 lb. heifers	head	54.81	52.68	52.68		52.68	52.68
Sell beef cow units	head	23.59	23.62	23.62	39.92	23.62	23.62
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy corn	bu.				4,056.98		
Buy alfalfa hay	ton				155.02		

Activities in Year 8	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Wheat	acre	620.0	620.0	620.0		620.0	620.0
Livestock Activities							
Beef cow herd	head	191.13	189.84	189.84	255.25	189.84	189.84
Wintering steers, 425-600 lbs.	head	87.92	87.33	87.33	117.41	87.33	87.33
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	300.0	278.32	278.32	278.32	278.32	278.32
Full season tame pasture	acre		21.68	21.68	21.68	21.68	21.68
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	382.27	3,379.68	3,379.68	3,510.49	3,379.68	3,379.68
Buy oats	bu.	764.54	1,209.35	1,209.35	1,470.99	1,209.35	1,209.35
Buy alfalfa hay	ton	96.68	100.52	100.52	133.6	100.52	100.52
Buy prairie hay	ton	163.31	172.02	172.02	279.24	172.02	172.02
Buy barley	bu.	703.37	698.6	698.6	939.31	698.6	698.6
Sell beef cow units	head	4.62					
Sell 375 lb. heifers	head	53.52	53.15	53.15	71.46	53.15	53.15
Buy beef cow units	head		1.69	1.69	5.96	1.69	1.69
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0

Table 4-2. (continued)

Activities in Year 9	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	65.0	99.15	99.15		99.15	99.15
Prairie hay	acre	302.52	336.13	336.13	430.1	336.13	336.13
Wheat	acre	555.0	520.85	520.85		520.85	520.85
Livestock Activities							
Beef cow herd	head	129.19	121.83	121.83	161.96	121.83	121.83
Wintering steers, 425-600 lbs.	head	59.43	56.04	56.04	74.5	56.04	56.04
Wintering heifers, 375-600 lbs.	head	36.17	34.11	34.11	45.35	34.11	34.11
Sow/2-litter system, producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Ewe/lamb system producing July fat lambs	head		177.93	177.93	177.93	177.93	177.93
Pasture Activities							
Native pasture	acre	1,197.48	1,163.87	1,163.87	1,689.9	1,163.87	1,163.87
Short season tame pasture	acre	300.0					
Full season tame pasture	acre		300.0	300.0	300.0	300.0	300.0
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	547.76	4,406.2	4,406.2	4,576.36	4,406.2	4,406.2
Buy oats	bu.	1,023.18	1,414.9	1,414.9	1,732.73	1,414.9	1,414.9
Buy barley	bu.	475.42	448.34	448.34	596.02	448.34	448.34
Sell beef cow units	head	61.95	68.01	68.01	93.29	68.01	68.01
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa hay	ton				143.22		

Activities in Year 10	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	48.64	49.37	49.37		49.37	49.37
Prairie hay	acre	317.25	301.78	301.78	400.16	301.78	301.78
Barley	acre	571.36	570.36	570.36		570.36	570.36
Livestock Activities							
Beef cow herd	head	153.86	147.28	147.28	195.3	147.28	147.28
Wintering and Summering steers, 425-825 lbs.	head	70.77	67.75	67.75	89.84	67.75	67.75
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,184.75	1,198.22	1,198.22	1,719.84	1,198.22	1,198.22
Short season tame pasture	acre	83.06	73.48	73.48	5.78	73.48	73.48
Full season tame pasture	acre	216.94	226.52	226.52	294.22	226.52	226.52
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	307.71	3,294.56	3,294.56	3,390.59	3,294.56	3,294.56
Buy oats	bu.	615.42	1,039.12	1,039.12	1,231.19	1,039.12	1,039.12
Sell barley	bu.	16,574.68	16,576.87	16,576.87		16,576.87	16,576.87
Buy beef cow units	head	24.67	25.45	25.45	33.34	25.45	25.45
Sell 375 lb. heifers	head	43.08	41.24	41.24	54.68	41.24	41.24
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa hay	ton				103.28		
Buy barley	bu.				718.69		

CHAPTER V

RESULTS OF MODEL II

A summary of the ranch activities selected by each of the strategies evaluated with Model II and the total ranch profits associated with each of those strategies are presented in this chapter. Also, a brief comparison of the strategies and a presentation of the annual ranch profits and the optimum ranch organization of each strategy are included in this chapter.

The Beef-Crop-Pasture Strategy

Activities Selected

Beef production was the only livesotck enterprise allowed with this strategy. In the first and second year over 190 cows producing beef calves were maintained. In the third, fourth and fifth year the cow herd steadily declined to 168, 146 and 114 head, respectively. In the sixth year 114 head were maintained during the worst year of drought. Herd size increased to over 190 head in the seventh and eighth year. Beef cows dropped to 129 head in the ninth year, but recovered to 153 head in the tenth year.

While small grain and alfalfa hay dominated the crop program, corn was grown in the first, third, fifth and seventh years of the ten-year period. Wheat was planted on

all 620 cropland acres in the eighth year.

Pasture acreage was completely utilized in all years except the sixth year when virtually no pasture yields existed because of drought. In the sixth year 300 acres of full season pasture and 1,201 acres of rented pasture were used to maintain the 114-head cow-calf operation.

All necessary livestock feed not grown was purchased and all excess livestock feed grown was sold with every strategy of Model II.

Operating capital was borrowed in the first, second and fourth through seventh years of the ten-year period. The largest amounts of capital borrowing were required in the sixth and seventh year to provide capital both during the drought and the first year of recovery.

Table 5-2 on page 53 presents the optimum ranch organization of each of the strategies evaluated with Model II.

Ranch Profits

Total ranch profit resulting from the beef-crop-pasture strategy over the ten-year period was -$65,647.58. Annual profits greater than zero in dollar value resulted only in the seventh and eighth years of the ten-year period. Annual profits ranged from a low of -$38,109.87 in the sixth year to a high of $27,708.44 in the eighth year. Table 5-1

on page 52 presents the annual and total profits for each of the strategies evaluated with Model II.

The Diversification Strategy

Activities Selected

The beef cow herd under the diversification strategy with Model II varied in size with the drought conditions. Between 195 and 200 head were maintained in the first three years. Herd size dropped to 162 head in the fourth year and was maintained at 111 cows in the fifth and sixth years. Herd size increased to 189 head by the eighth year, dropped to 121 cows in the ninth year, and recovered to 147 cows in the tenth year.

Supplementary hog and sheep activities were included under this strategy. In each year of the ten-year period 240 pigs were farrowed, finished and sold as butcher hogs. In the ninth year 177 ewes producing fat lambs were maintained.

The crop program was similar to that selected with the beef-crop-pasture strategy. Sufficient feed quantities of alfalfa hay were grown in every year except the sixth and eighth year of the ten-year period. Although alfalfa hay was planted in the sixth year no yields were realized because of drought.

All 1,800 acres of pasture land were utilized in

every year except the worst drought year. In the sixth year 300 acres of full season pasture and 1,174 acres of rented pasture were used to maintain the beef cow herd and the hogs.

Capital borrowing was required only during the three-year drought period. In the fourth year $2,875.91 was borrowed. In the fifth year capital borrowing was $35,399.11 and in the sixth year it was $40,226.44.

Ranch Profits

Annual profits were greater than zero in dollar value in the first, second, seventh, eighth and tenth years. Annual profits ranged from -$34,229.77 in the sixth year to $44,320.13 in the eighth year. Total ranch profit for the diversification strategy over the ten-year period was $11,466.53.

The Diversification Strategy Adjusted to Maintain the Beef Cow Herd During Drought

Activities Selected

This strategy adjusted forage costs in the third year of drought to a level that would permit maintaining the herd at a level realized in the second year of drought. Forage costs for the diversification strategy did not rise to a point where it was profitable to eliminate the beef cow herd. Therefore, the activities selected with this

strategy were identical to those selected with the diversification strategy.

Ranch Profits and Forage Costs

The annual and total ranch profits for this strategy were identical to those of the diversification strategy.

Total forage costs per cow unit to maintain the beef cow herd during drought were $106.90. Forage costs equal to or less than $106.90 per cow unit were required to maintain a beef cow herd of 111 head. This is the same number of cows that was maintained in the diversification strategy.

The Diversification Strategy Adjusted to Sell the Beef Cow Herd During Drought

Activities Selected

Only in the sixth, seventh and eighth years did this strategy differ from the optimum results for the diversification strategy. In the sixth year the beef cow herd was sold. Only 40 acres of full season pasture and 71 acres of rented pasture were used to maintain the hogs. Only $808.62 worth of capital borrowing was required in the sixth year.

In the seventh and eighth years large amounts of capital borrowing were required to replace the beef cow herd and further assist recovery from the drought.

Ranch Profits and Forage Costs

Total ranch profit for this strategy was less than total ranch profit for the diversification strategy primarily because of the increased cost of rented pasture. Annual profits differed from the diversification strategy only in the sixth, seventh and eighth years. Total ranch profit for this strategy over the ten-year period was $9,154.16.

The total forage cost per cow unit necessary to eliminate the beef cow herd was $154.90. Forage costs greater than $154.90 per cow unit resulted in selling the entire beef cow herd during the drought. Forage costs which ranged between $106.90 and $154.90 per cow unit resulted in a reduction in the size of the beef cow herd during the drought.

The Diversification Strategy with Profits Maximized in the Worst Year of Drought

Activities Selected

The activities selected by this strategy were identical to those selected with the diversification strategy in the first through the third year and the eighth through the tenth year. In the fourth year, the livestock activities selected included a 177-head cow herd and seven sows producing 115 feeder pigs. All crop and pasture acreage was utilized. Only 643 bushels of corn were required as no

hogs were finished and sold as butcher hogs.

In the fifth year 111 beef cows were maintained and 240 butcher hogs were produced and sold. All cropland and pasture acreages were used. Corn was grown for feed.

In the sixth year 40 beef cows were maintained and 240 butcher hogs were produced and sold. Of the pasture acreage 163 acres of full season pasture and 446 acres of rented pasture were used to maintain the cattle and hogs. Although 620 acres of alfalfa were planted no yields were realized.

In the seventh year 188 beef cows were maintained and 240 butcher hogs were produced and sold. All cropland and pasture acreages were used.

Capital borrowing was required in the fourth through the seventh year. However, only $7,685.64 worth of capital borrowing was necessary in the sixth year. It should be noted that under this strategy the profit row in the sixth year became the objective function. In the seventh year $45,898.53 worth of capital borrowing was required to assist recovery.

Ranch Profits

Total ranch profit over the ten-year period for this strategy was $3,035.63. Annual profits ranged from a low of -$33,633.97 in the sixth year to a high of $44,320.13 in the eighth year. Annual profits greater than zero in dollar

value occurred in the first, second, seventh, eighth and tenth years.

The Beef-Hogs-Sheep-Pasture Strategy

Activities Selected

Because of the larger amount of pasture land employed with this strategy beef cow herds were generally larger in size. In the first year 271 cows were maintained. Herd size dropped steadily to 149 head in the fifth year. The beef cow herd was actually increased to 154 head in the sixth year (the worst year of the drought). Herd size increased to 255 head by the eighth year. Due to unfavorable prices in the ninth year the cow herd dropped to 161 head, but increased to 195 head in the tenth year.

In each year of the ten-year period 240 pigs were farrowed, finished and sold. In the ninth year 177 ewes producing fat lambs were selected.

The full amount of pasture acreage was used in every year except the sixth year when virtually no yields existed. because of drought. In the sixth year 300 acres of full season pasture were used and an additional 1,581 acres of rented pasture were purchased to maintain the beef cow herd and the hogs.

Capital borrowing was required in the first, second and fifth through seventh years. Capital borrowing peaked

at $51,216.94 in the seventh year.

Ranch Profits

Annual profits ranged from -$28,708.77 in the sixth year to $25,898.73 in the eighth year. Annual profits were less than zero in dollar value in every year except the seventh and eighth years. Total profit for the beef-hogs-sheep-pasture strategy over the ten-year period was -$57,384.89.

A Comparison of the Strategies

A comparison of strategies evaluated with Model II indicated many of the same relationships among strategies which were evident from a comparison of strategies evaluated with Model I. Land and investment capital were the primary resource limitations on the ranch organization. Labor was completely used in only the September-October time period of the first year with the beef-crop pasture strategy and in the third and seventh years with all strategies evaluated with Model II except the beef-hogs-sheep-pasture strategy.

The diversification strategy proved to be the best strategy for maximizing profits. This strategy resulted in greater profits than the beef-crop-pasture strategy because the resources necessary to add supplementary livestock activities were available and could be used without adversely affecting the size of the beef cow herd.

The diversification strategy with profits maximized in the worst drought year resulted in lower profits than the diversification strategy. Profits were maximized in the worst year of the drought primarily by reducing the need for borrowed capital. This was accomplished by reducing the size of the beef cow herd maintained during the worst drought year. Liquidation of much of the beef cow herd in the worst year of drought provided additional cash flow to reduce the amount of capital borrowing required in the worst drought year. Such a strategy did not permit adequate diversification in the years previous to the worst drought year and resulted in lower profits.

The diversification strategy resulted in greater profits than the beef-hogs-sheep-pasture strategy because the additional acres of native pasture, while permitting a larger herd of beef cows, could not adequately replace the loss of income from 620 acres of cropland.

The beef-crop-pasture strategy and the beef-hogs-sheep-pasture strategy were the most undesirable in terms of maximizing profits. A ranch operator employing either of these strategies might be required to severely cut expenses annually in order to guarantee continued operation.

Table 5-1 presents the annual and total profits resulting from each strategy. Table 5-2 presents the optimum ranch organization for each of the strategies. The strategies are labelled in the same manner as the strategies presented in Chapter IV.

Table 5-1. Annual and Total Profits for Various Strategies with Model II.

Profits	Strategies					
	(1)	(2)	(3)	(4)	(5A)	(5B)
First Year Profit	$- 1,613.12	$ 2,668.56	$ 2,668.56	$- 5,895.68	$ 2,668.56	$ 2,668.56
Second Year Profit	- 3,910.52	756.61	756.61	- 8,394.55	756.61	756.61
Third Year Profit	- 5,171.10	- 2,136.14	- 2,136.14	- 8,588.93	- 2,136.14	- 2,136.14
Fourth Year Profit	-17,439.44	- 9,518.37	-17,533.31	- 7,076.05	- 9,518.37	- 9,518.37
Fifth Year Profit	-25,380.43	-19,791.39	-20,373.78	-13,539.19	-19,791.39	-19,791.39
Sixth Year Profit	-38,109.87	-34,229.77	-33,633.97	-28,708.77	-34,229.77	-34,980.91
Seventh Year Profit	-12,900.15	18,557.86	18,128.48	10,812.23	18,557.86	17,807.72
Eighth Year Profit	27,708.44	44,320.13	44,320.13	25,898.73	44,320.13	43,509.04
Ninth Year Profit	- 8,371.43	- 1,370.55	- 1,370.55	-17,424.70	- 1,370.55	- 1,370.55
Tenth Year Profit	- 6,260.27	12,209.58	12,209.58	- 4,467.97	12,209.58	12,209.58
Total Profit	-65,647.58	11,466.53	3,035.63	-57,384.89	11,466.53	9,154.16

Table 5-2. Optimum Ranch Organization with Model II

Activities in Year 1	Units	Strategies 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Corn grain	acre	499.69	378.04	378.02		378.02	378.02
Alfalfa hay	acre	88.69	88.71	88.71		88.71	88.71
Rye	acre	31.62	153.27	153.27		153.27	153.27
Livestock activities							
Beef cow herd	head	199.72	200.92	200.92	271.99	200.92	200.92
Wintering heifers, 375-600 lbs.	head	55.92	56.26	56.26	76.16	56.26	56.26
Wintering and Summering steers, 425-825 lbs.	head	49.59	27.52	27.52	25.08	27.52	27.52
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	147.98	196.79	196.79	204.27	196.79	196.79
Full season tame pasture	acre	152.02	103.21	103.21	95.73	103.21	103.21
Purchase and Sale of Crops and Livestock							
Sell corn grain	bu.	21,639.16	13,158.98	13,158.98		13,158.98	13,158.98
Buy oats	bu.	1,581.81	2,041.29	2,041.29	2,604.19	2,041.29	2,041.29
Buy prairie hay	ton	305.4	295.6	295.6	393.83	295.6	295.6
Buy barley	bu.	396.74	220.17	220.17	200.65	220.17	220.17
Sell 425 lb. steers	head	42.28	64.9	64.9	100.04	64.9	64.9
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy corn grain	bu.				4,153.25		
Buy alfalfa	ton				145.72		
Borrow Capital	dol.	1,509.99			5,518.75		

Activities in Year 2	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	82.68	86.44	86.44		86.44	86.44
Barley	acre	537.32	533.56	533.56		533.56	533.56
Prairie hay	acre				210.26		
Livestock Activities							
Beef cow herd	head	198.54	200.12	200.12	247.13	200.12	200.12
Wintering steers, 425-600 lbs.	head	44.23	66.23	66.23	89.38	66.23	66.23
Wintering heifers, 375-600 lbs.	head	55.59	56.03	56.03	69.2	56.03	56.03
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Wintering and Summering steers, 425-600 lbs.	head	47.1	25.83	25.83	24.3	25.83	25.83
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	1,909.74	1,500.0	1,500.0
Short season tame pasture	acre	142.14	192.83	192.83	197.96	192.83	192.83
Full season tame pasture	acre	157.86	107.17	107.17	102.04	107.17	107.17
Purchase and Sale of Crops and Livestock							
Buy corn grain	bu.	841.81	3,848.5	3,848.5	4,047.82	3,848.5	3,848.5
Buy oats	bu.	1,572.45	2,034.93	2,034.93	2,407.23	2,034.93	2,034.93
Buy prairie hay	ton	325.45	328.03	328.03	215.82	328.03	328.03
Sell barley	bu.	22,911.66	22,740.41	22,740.41		22,740.41	22,740.41
Sell beef cow units	head	1.18	.8	.8	24.87	.8	.8
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa	ton				153.72		
Buy barley	bu.				909.43		
Borrow Capital	dol.	4,772.36			6,904.98		

Table 5-2. (continued)

Activities in Year 3	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Corn grain	acre	521.39	426.96	426.96		426.96	426.96
Alfalfa hay	acre	53.52	60.52	60.52		60.52	60.52
Prairie hay	acre	238.88	2.23	2.23	338.04	2.23	2.23
Barley	acre	9.08	3.52	3.52		3.52	3.52
Rye	acre	36.02	129.01	129.01		129.01	129.01
Livestock Activities							
Beef cow herd	head	168.14	195.9	195.9	211.17	195.9	195.9
Wintering heifers, 375-600 lbs.	head	47.08	54.85	54.85	59.13	54.85	54.85
Wintering and Summering steers, 425-825 lbs.	head	43.12	16.72	16.72	49.03	16.72	16.72
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,261.12	1,497.77	1,497.77	1,781.96	1,497.77	1,497.77
Short season tame pasture	acre	173.54	232.92	232.92	138.18	232.92	232.92
Full season tame pasture	acre	126.46	67.07	67.07	161.82	67.07	67.07
Purchase and Sale of Crops and Livestock							
Sell corn grain	bu.	23,270.88	15,809.35	15,809.35		15,809.35	15,809.35
Buy oats	bu.	1,331.69	2,001.56	2,001.56	2,122.47	2,001.56	2,001.56
Buy prairie hay	ton	30.88	280.84	280.84		280.84	280.84
Sell beef cow units	head	30.4	4.21	4.21	35.96	4.21	4.21
Sell 425 lb. steers	head	34.22	73.39	73.39	48.11	73.39	73.39
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy corn grain	bu.				3,895.36		
Buy alfalfa hay	ton				120.94		
Buy barley	bu.				392.24		

Activities in Year 4	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	74.14	86.2	92.0		86.2	86.2
Rye	acre	545.86	533.8	528.0		533.8	533.8
Livestock Activities							
Beef cow herd	head	146.57	161.53	177.63	192.63	161.53	161.53
Wintering and Summering Steers, 425-825 lbs.	head	67.42	14.38		70.08	14.38	14.38
Wintering Steers, 425-600 lbs.	head		59.92	81.71	18.53	59.92	59.92
Sow/2-litter system producing feeder pigs	head		240.0	115.2	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0		240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	34.66	219.21			219.21	219.21
Full season tame pasture	acre	265.34	80.79	300.0	300.0	80.79	80.79
Purchase and Sale of Crops and Livestock							
Buy corn	bu.	293.14	3,323.06	643.26	3,385.26	3,323.06	3,323.06
Buy oats	bu.	586.28	1,096.12	926.52	1,220.52	1,096.12	1,096.12
Buy prairie hay	ton	240.26	264.78	291.17	315.76	264.78	264.78
Buy barley	bu	539.38	594.43	653.57	708.87	594.43	594.43
Sell beef cow units	head	21.57	34.37	18.27	18.54	34.37	34.37
Sell 375 lb. heifers	head	41.04	45.23	49.74	53.97	45.23	45.23
Sell aged sow	head		15.0	7.2	15.0	15.0	15.0
Sell feeder pigs	head			115.2			
Buy alfalfa hay	ton				101.93		
Borrow Capital	dol.	7,010.58		11,959.60			

Table 5-2. (continued)

Activities in Year 5	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Corn grain	acre	32.32	231.62	231.62		231.62	231.62
Alfalfa hay	acre	138.06	144.1	144.1		144.1	144.1
Barley	acre	449.62	244.27	244.27		244.27	244.27
Livestock Activities							
Beef cow herd	head	114.33	111.88	111.88	149.59	111.88	111.88
Wintering steers, 425-600 lbs.	head	52.59	51.46	51.46	68.81	51.46	51.46
Wintering heifers, 375-600 lbs.	head	32.01	31.33	31.33	41.88	31.33	31.33
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	300.0	259.68	259.68	259.68	259.68	259.68
Full season tame pasture	acre		40.32	40.32	40.32	40.32	40.32
Purchase and Sale of Crops and Livestock							
Buy oats	bu.	905.49	1,336.06	1,336.06	1,634.73	1,336.06	1,336.06
Buy prairie hay	ton	37.41	53.55	53.55	115.36	53.55	53.55
Sell barley	bu.	6,323.54	3,252.42	3,252.42		3,252.42	3,252.42
Sell beef cow units	head	32.24	49.65	65.75	43.04	49.65	49.65
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy corn grain	bu.				3,634.25		
Buy alfalfa hay	ton				94.82		
Buy barley	bu.				550.48		
Borrow Capital	dol.	23,523.79	2,875.91	9,825.66	1,258.44	2,875.91	2,875.91

Activities in Year 6	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	620.0	620.0	620.0		620.0	620.0
Livestock Activities							
Beef cow herd	head	114.33	111.88	40.7	154.84	111.88	
Wintering steers, 425-600 lbs.	head	6.85	11.87		31.64	11.87	
Wintering and Summering steers, 425-825 lbs.	head	45.74	39.59	18.71	39.59	39.59	
Sow/s-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Wintering heifers, 375-600 lbs.	head	32.01	31.33	11.39	43.36	31.33	
Pasture Activities							
Full season tame pasture	acre	300.0	300.0	163.11	300.0	300.0	40.32
Rented pasture	acre	1,201.41	1,174.55	446.13	1,581.84	1,174.55	71.44
Purchase and Sale of Crops and Livestock							
Buy corn grain	bu.	484.76	3,474.35	3,172.55	3,656.54	3,474.35	3,000.0
Buy oats	bu.	905.49	1,336.06	772.31	1,676.37	1,336.06	450.0
Buy alfalfa hay	ton	69.03	72.05	29.07	98.0	72.05	4.5
Buy prairie hay	ton	187.41	183.39	66.71	253.82	183.39	
Buy barley	bu.	420.73	411.7	149.76	569.83	411.7	
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Sell beef cow units	head			71.18			111.88
Buy beef cow units	head				5.26		
Borrow Capital	dol.	47,675.4	35,399.11	7,685.65	28,212.88	35,399.11	808.62

Table 5-2. (continued)

Activities in Year 7	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Corn grain	acre	495.28	383.11	383.11		383.11	383.11
Alfalfa hay	acre	61.93	62.29	62.29		62.29	62.29
Wheat	acre	62.84	174.61	174.61		174.61	174.61
Livestock Activities							
Beef cow herd	head	195.76	188.14	188.14	249.29	188.14	188.14
Wintering and Summering steers, 425-825 lbs.	head	90.05	86.55	86.55	114.67	86.55	86.55
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Wintering heifers, 375-600 lbs.	head				69.8		
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	76.71	70.15	70.15	.41	70.15	70.15
Full season tame pasture	acre	223.29	229.85	229.85	299.59	229.85	229.85
Purchase and Sale of Crops and Livestock							
Sell corn grain	bu.	24,867.81	16,162.08	16,162.08		16,162.08	16,162.08
Buy oats	bu.	783.03	1,202.57	1,202.57	2,424.36	1,202.57	1,202.57
Buy prairie hay	ton	320.88	308.4	308.4	408.63	308.4	308.4
Buy barley	bu.	720.38	692.37	692.37	917.38	692.37	692.37
Buy beef cow units	head	81.43	76.27	147.45	94.44	76.27	188.14
Sell 375 lb. heifers	head	54.81	52.68	52.68		52.68	52.68
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy corn grain	bu.			4,056.98			
Buy alfalfa hay	ton				155.02		
Borrow Capital	dol.	50,118.77	40,226.44	45,898.53	51,216.94	40,226.44	50,135.76

Activities in Year 8	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Wheat	acre	620.0	620.0	620.0		620.0	620.0
Livestock Activities							
Beef cow herd	head	191.13	189.84	189.84	255.25	189.84	189.84
Wintering steers, 425-600 lbs.	head	87.92	87.33	87.33	117.41	87.33	87.33
Sow/2-litter system, producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system, producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,500.0	1,500.0	1,500.0	2,120.0	1,500.0	1,500.0
Short season tame pasture	acre	300.0	278.32	278.32	278.32	278.32	278.32
Full season tame pasture	acre		21.68	21.68	21.68	21.68	21.68
Purchase and Sale of Crops and Livestock							
Buy corn grain	bu.	382.27	3,379.68	3,379.68	3,510.29	3,379.68	3,379.68
Buy oats	bu.	764.54	1,209.35	1,209.35	1,470.99	1,209.35	1,209.35
Buy alfalfa hay	ton	96.68	100.52	100.52	133.6	100.52	100.52
Buy prairie hay	ton	163.31	172.02	172.02	279.24	172.02	172.02
Buy barley	bu.	703.37	698.6	698.6	939.31	698.6	698.6
Sell beef cow units	head	4.62	1.69	1.69		1.69	1.69
Sell 375 lb. heifers	head	53.52	53.15	53.15	71.47	53.15	53.15
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy beef cow units	head				5.96		
Borrow Capital	dol.						9,772.26

Table 5-2. (continued)

Activities in Year 9	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	65.0	99.15	99.15		99.15	99.15
Prairie hay	acre	302.52	336.13	336.13	430.1	336.13	336.13
Wheat	acre	555.0	520.85	520.85		520.85	520.85
Livestock Activities							
Beef cow herd	head	129.19	121.83	121.83	161.96	121.83	121.83
Wintering steers, 425-600 lbs.	head	59.43	56.04	56.04	74.5	56.04	56.04
Wintering heifers, 374-600 lbs.	head	36.17	34.11	34.11	45.35	34.11	34.11
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Ewe/lamb system producing fat lambs	head		177.93	177.93	177.93	177.93	177.93
Pasture Activities							
Native pasture	acre	1,197.48	1,163.87	1,163.87	1,689.9	1,163.87	1,163.87
Short season tame pasture	acre	300.0					
Full season tame pasture	acre		300.0	300.0	300.0	300.0	300.0
Purchase and Sale of Crops and Livestock							
Buy corn grain	bu.	547.76	4,406.2	4,406.2	4,576.36	4,406.2	4,406.2
Buy oats	bu.	1,023.18	1,414.9	1,414.9	1,732.73	1,414.9	1,414.9
Buy barley	bu.	475.42	448.34	448.34	596.02	448.34	448.34
Sell beef cow units	head	61.95	68.01	68.01	93.29	68.01	68.01
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa hay	ton				143.22		

Activities in Year 10	Units	Strategy Number 1	2	3	4	5A	5B
		Number of Units					
Crop Activities							
Alfalfa hay	acre	48.64	49.37	49.37		49.37	49.37
Prairie hay	acre	315.25	301.78	301.78	400.16	301.78	301.78
Barley	acre	571.36	570.63	570.63		570.63	570.63
Livestock Activities							
Beef cow herd	head	153.86	147.28	147.28	195.3	147.28	147.28
Wintering and Summering steers, 425-825 lbs.	head	70.77	67.75	67.75	89.84	67.75	67.75
Sow/2-litter system producing feeder pigs	head		240.0	240.0	240.0	240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0	240.0	240.0	240.0
Pasture Activities							
Native pasture	acre	1,184.75	1,198.22	1,198.22	1,719.84	1,198.22	1,198.22
Short season tame pasture	acre	83.06	73.48	73.48	5.78	73.48	73.48
Full season tame pasture	acre	216.94	226.52	226.52	294.22	226.52	226.52
Purchase and Sale of Crops and Livestock							
Buy corn grain	bu.	307.71	3,294.56	3,294.56	3,390.49	3,294.56	3,294.56
Buy oats	bu.	615.42	1,039.12	1,039.12	1,231.19	1,039.12	1,039.12
Sell barley	bu.	16,574.68	16,576.87	16,576.87		16,576.87	16,576.87
Buy beef cow units	head	24.67	25.45	25.45	33.34	25.45	25.45
Sell 375 lb. heifers	head	43.08	41.24	41.24	54.68	41.24	41.24
Sell aged sow	head		15.0	15.0	15.0	15.0	15.0
Buy alfalfa hay	ton				103.28		
Buy barley	bu.				718.69		

CHAPTER VI

RESULTS OF MODEL III

The purpose of this chapter was to summarize the optimum ranch activities and the ranch profits for each strategy and to compare the strategies in terms of the total ranch profits associated with each of them. The annual profits and the optimum ranch organization of each strategy evaluated with Model III are also presented in this chapter.

Three strategies were evaluated with this no-drought model.

The Beef-Crop-Pasture Strategy

Activities Selected

With the no-drought model the size of the beef cow herd was much less variable over the ten-year period with all strategies than with either Models I or II. The beef cow herd varied between 168 and 219 head in the first eight years of the ten-year period. Because of unfavorable prices in the ninth year the beef cow herd was reduced to 129 head, but recovered to 153 head in the tenth year.

Corn was grown on more than 495 acres in each of the first, third, fourth and seventh years. Sufficient feed quantities of alfalfa hay were grown in every year except the eighth year. In the eighth year wheat was grown on all

620 cropland acres. More than 500 acres of either wheat, barley or rye were grown in the second, fifth, sixth, ninth and tenth years.

The pasture acreage was completely utilized in every year of the ten-year period.

Necessary livestock feed not grown was purchased and excess livestock feed grown was sold in every year with every strategy of Model III.

Capital borrowing was an important indicator of the financial status of the ranch firm. Capital borrowing was required when annual cash disbursements exceeded annual cash receipts. Even with the no-drought model capital borrowing was required in the first, second and fourth through sixth years of the ten-year period. Capital borrowing peaked at $24,943.66 in the fifth year.

Table 6-2 on page 65 presents the optimum ranch organization for all the strategies evaluated with Model III.

Ranch Profits

Even with the no-drought model annual profits greater than zero in dollar value only resulted in the sixth, seventh and eighth years. Annual profits ranged from a low of -$10,519.28 in the fourth year to a high of $27,708.44 in the eighth year. Total ranch profit over the ten-year period for the beef-crop-pasture strategy was $3,606.22. Table 6-1 on page 64 presents the annual and total profits

resulting from each of the strategies evaluated with Model III.

The Diversification Strategy

Activities Selected

The beef cow herd consisted of between 195 and 200 cows in the first three years. In the fourth year herd size dropped to 163 head. The beef cow herd varied in size from 188 to 211 head in the fifth through the eighth years. In the ninth year the herd size dropped to 121 head due to unfavorable prices, but recovered to 147 head in the tenth year.

Supplementary hog and sheep production was included under this strategy. In each year of the ten-year period 240 pigs were farrowed, finished and sold. In the fifth year 11 ewes producing fat lambs and in the ninth year 177 ewes producing fat lambs were selected.

The crop program was similar to that selected with the beef-crop-pasture strategy. The full amount of pasture acreage was used in every year of the ten-year period.

In the fifth year $5,016.22 worth of capital borrowing was required. In the sixth year $10,456.14 worth of capital borrowing was required.

Ranch Profits

Total ranch profit over the ten-year period for the

diversification strategy was $78,812.68. Annual profits less than zero in dollar value resulted only in the third, fourth and ninth years. Annual profits ranged from a low of -$3,052.60 to a high of $44,320.13.

The Beef-Hogs-Sheep-Pasture Strategy

Activities Selected

The beef cow herd varied in size from 212 to 289 head in the first eight years of the ten-year period. Because of unfavorable prices the herd was reduced to 161 head in the ninth year, but recovered to 195 head in the tenth year.

In each year of the ten-year period 240 pigs were farrowed, finished and sold as 225-pound butcher hogs. In the fifth year seven ewes producing fat lambs and in the ninth year 177 ewes producing fat lambs were maintained.

The pasture acreage was completely used in every year of the ten-year period.

Capital borrowing was required in the first, second, fifth and sixth years. Capital borrowing peaked at $21,990.28 in the fifth year.

Ranch Profits

Annual profits were less than zero in dollar value in every year except the sixth through the eighth year. Annual profits ranged from -$17,424.70 in the ninth year to $25,898.73 in the eighth year. Total ranch profit over the

ten-year period for the beef-hogs-sheep-pasture strategy was -$9,217.21.

A Comparison of Strategies

A comparison of strategies evaluated with Model III resulted in many of the same findings that resulted from earlier comparisons of strategies evaluated with Models I and II. Land and investment capital were the primary resource limitations affecting the ranch organization. Labor was completely used in only the September-October time period of the first year with the beef-crop pasture strategy and in the third, fourth, and seventh years with the beef-crop-pasture strategy and the diversification strategy. Labor was never completely used with the beef-hogs-sheep-pasture strategy with any of the models.

The diversification strategy was considered to be the best strategy for maximizing profits. This strategy resulted in greater profits than the beef-crop-pasture strategy because supplementary hog and sheep production could be added without adversely affecting the size of the beef cow herd. More complete use of the available ranch labor would also result. Even without a designed drought period the ranch firm could only generate annual profits greater than zero in dollar value in three of the ten years of the planning period for the beef-crop-pasture strategy.

The diversification strategy resulted in greater

profits than the beef-hogs-sheep-pasture strategy primarily because the additional acres of native pasture, while permitting a larger beef cow herd, could not adequately replace the loss of income from 620 acres of cropland. Even with the no-drought model the total profit over the ten-year period for the beef-hogs-sheep-pasture strategy was -$9,217.211.

The beef-crop-pasture strategy and the beef-hogs-sheep-pasture strategy proved to be most undesirable in terms of maximizing profits with Model III as they had with Models I and II. Both strategies might require the ranch operator to severely cut expenses annually in order to guarantee survival.

Table 6-1 presents the annual and total ranch profits resulting from each strategy. Table 6-2 presents the optimum ranch organization for each of the strategies. The strategies are labelled in the same manner as the strategies evaluated with Models I and II presented in Chapters IV and V.

Table 6-1. Annual and Total Profits for Various Management Strategies with Model III.

Profits	Strategies		
	(1)	(2)	(4)
First Year Profit	$- 1,613.12	$ 2,668.56	$- 5,895.68
Second Year Profit	- 3,910.52	756.61	- 8,778.97
Third Year Profit	- 5,171.10	- 2,136.14	- 8,608.41
Fourth Year Profit	-10,519.28	- 3,052.60	- 3,477.46
Fifth Year Profit	- 5,496.73	403.51	- 3,386.77
Sixth Year Profit	546.09	3,410.57	2,234.68
Seventh Year Profit	16,694.13	21,603.00	14,689.36
Eighth Year Profit	27,708.44	44,320.13	25,898.73
Ninth Year Profit	- 8,371.43	- 1,370.55	-17,424.70
Tenth Year Profit	- 6,260.27	12,209.58	- 4,467.97
Total Profit	3,606.22	78,812.68	- 9,217.21

Table 6-2. Optimum Ranch Organization with Model III

Activities in Year 1	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Corn grain	acre	499.69	378.02	
Alfalfa hay	acre	88.69	88.71	
Rye	acre	31.62	153.27	
Livestock Activities				
Beef cow herd	head	199.72	200.92	271.99
Wintering heifers, 375-600 lbs.	head	55.92	56.26	76.16
Wintering and Summering steers, 425-825 lbs.	head	49.59	27.52	25.08
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Pasture Activities				
Native pasture	acre	1,500.0	1,500.0	2,120.0
Short season tame pasture	acre	147.98	196.79	204.27
Full season tame pasture	acre	152.02	103.21	95.73
Purchase and Sale of Crops and Livestock				
Sell corn grain	bu.	21,639.16	13,158.98	
Buy oats	bu	1,581.81	2,041.29	2,604.19
Buy prairie hay	ton	305.4	295.6	393.83
Buy barley	bu.	396.74	220.17	200.65
Sell 425 lb. steers	head	42.28	64.9	100.04
Sell aged sow	head		15.0	15.0
Buy corn grain	bu.			4,153.25
Buy alfalfa hay	ton			145.72
Borrow Capital	dol.	1,509.99		5,518.75

Activities in Year 2	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Alfalfa hay	acre	82.68	86.44	
Barley	acre	537.32	533.56	
Prairie hay	acre			31.86
Livestock Activities				
Beef cow herd	head	198.54	200.12	267.59
Wintering steers, 425-600 lbs.	head	44.23	66.23	99.46
Wintering heifers, 375-600 lbs.	head	55.59	56.03	74.93
Wintering and Summering steers, 425-825 lbs.	head	47.1	25.83	23.63
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Pasture Activities				
Native pasture	acre	1,500.0	1,500.0	2,088.14
Short season tame pasture	acre	142.14	192.83	200.2
Full season tame pasture	acre	157.86	107.17	99.8
Purchase and Sale of Crops and Livestock				
Buy corn grain	bu.	841.81	3,848.5	4,134.60
Buy oats	bu.	1,572.45	2,034.93	2,569.35
Buy prairie hay	ton	325.45	328.03	409.97
Sell barley	bu.	22,911.66	22,740.41	
Sell beef cow units	head	1.18	.8	4.4
Sell aged sow	head		15.0	15.0
Buy alfalfa hay	ton			166.07
Buy barley	bu.			984.75
Borrow Capital	dol.	4,772.36		12,274.16

Table 6-2. (continued)

Activities in Year 3	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Corn grain	acre	521.39	426.96	
Alfalfa hay	acre	53.52	60.52	
Prairie hay	acre	238.88	2.23	338.3
Barley	acre	9.08	3.52	
Rye	acre	36.02	129.01	
Livestock Activities				
Beef cow herd	head	168.14	195.9	212.22
Wintering heifers, 375-600 lbs.	head	47.08	54.85	59.42
Wintering and Summering steers, 425-825 lbs.	head	43.12	16.72	46.69
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Pasture Activities				
Native pasture	acre	1,261.12	1,497.77	1,781.7
Short season tame pasture	acre	173.54	232.93	145.04
Full season tame pasture	acre	126.46	67.07	154.96
Purchase and Sale of Crops and Livestock				
Sell corn grain	bu.	23,270.88	15,809.35	
Buy oats	bu.	1,331.69	2,001.56	2,130.75
Buy prairie hay	ton	30.88	280.85	
Sell beef cow units	head	30.4	4.21	55.38
Sell 425 lb. steers	head	34.22	73.39	50.93
Sell aged sow	head		15.0	15.0
Buy corn grain	bu.			3,899.79
Buy alfalfa hay	ton			120.92
Buy barley	ton			373.54

Activities in Year 4	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Corn grain	acre	510.3	398.1	
Oats	acre	61.49	173.32	
Alfalfa hay	acre	48.21	48.58	
Livestock Activities				
Beef cow herd	head	171.58	163.99	222.73
Wintering and Summering steers, 425-825 lbs.	head	78.93	75.44	91.72
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Wintering steers, 425-600 lbs.	head			10.73
Pasture Activities				
Native pasture	acre	1,500.0	1,500.0	2,120.0
Short season tame pasture	acre	58.06	49.92	
Full season tame pasture	acre	241.94	250.08	300.0
Purchase and Sale of Crops and Livestock				
Sell corn grain	bu.	19,588.53	12,197.91	
Sell oats	bu.	2,019.07	6,520.07	1,340.91
Buy prairie hay	ton	281.25	268.81	365.09
Buy barley	bu.	631.42	603.48	819.63
Buy beef cow units	head	3.44		10.51
Sell 375 lb. heifers	head	48.04	45.92	62.36
Sell beef cow units	head		31.91	
Sell aged sow	head		15.0	15.0
Buy corn grain	bu.			3,445.45
Buy alfalfa hay	ton			117.15
Borrow Capital	dol.	7,726.41		

Table 6-2. (continued)

Activities in Year 5	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Alfalfa hay	acre	70.57	74.22	
Rye	acre	549.43	545.78	
Livestock Activities				
Beef cow herd	head	204.54	203.29	265.5
Wintering steers, 425-600 lbs.	head	94.09	93.52	122.13
Wintering heifers, 375-600 lbs.	head	57.27	56.92	74.34
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Ewe/lamb system producing fat lambs	head		11.46	7.7
Pasture Activities				
Native pasture	acre	1,500.0	1,500.0	2,120.0
Short-season tame pasture	acre	300.0	265.92	271.57
Full season tame pasture	acre		34.08	28.43
Purchase and Sale of Crops and Livestock				
Buy corn grain	bu.	867.23	3,919.28	4,164.19
Buy oats	bu.	1,619.93	2,060.09	2,552.76
Buy prairie hay	ton	185.28	202.57	300.96
Buy barley	bu.	752.69	748.12	977.04
Buy beef cow units	head	32.96	39.3	42.77
Sell aged sow	head		15.0	15.0
Buy alfalfa hay	ton			166.58
Borrow Capital	dol.	24,943.66	5,016.22	21,990.28

Activities in Year 6	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Alfalfa hay	acre	101.88	101.82	
Wheat	acre	518.12	518.18	
Livestock Activities				
Beef cow herd	head	219.35	211.76	289.21
Wintering heifers, 375-600 lbs.	head	61.42	59.29	80.98
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Wintering steers, 425-600 lbs.	head			18.69
Wintering and Summering steers, 425-825 lbs.	head	100.9	97.41	114.34
Pasture Activities				
Native pasture	acre	1,500.0	1,500.0	2,120.0
Short-season tame pasture	acre	48.78	42.17	
Full season tame pasture	acre	251.22	257.83	300.0
Purchase and Sale of Crops and Livestock				
Buy corn grain	bu.	930.04	3,897.86	4,226.25
Buy oats	bu.	1,737.24	2,127.13	2,740.54
Buy prairie hay	ton	359.56	347.11	474.07
Buy barley	bu.	807.2	779.27	1,064.29
Buy beef cow units	head	14.81	8.46	23.71
Sell aged sow	head		15.0	15.0
Buy alfalfa hay	ton			179.12
Borrow Capital	dol.	17,187.46	10,456.14	19,655.86

Table 6-2. (continued)

Activities in Year 7	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Corn grain	acre	495.28	383.11	
Alfalfa hay	acre	61.88	62.29	
Wheat	acre	62.84	174.61	
Livestock Activities				
Beef cow herd	head	195.76	188.14	249.29
Wintering and Summering steers, 425-825 lbs.	head	90.05	86.55	114.67
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Wintering heifers, 375-600 lbs.	head			69.8
Pasture Activities				
Native pasture	acre	1,500.0	1,500.0	2,120.0
Short season tame pasture	acre	76.71	70.15	.41
Full season tame pasture	acre	223.29	229.85	299.59
Purchase and Sale of Crops and Livestock				
Sell corn grain	bu.	24,867.81	16,162.08	
Buy oats	bu.	783.03	1,202.57	2,424.36
Buy prairie hay	ton	320.88	308.4	408.63
Buy barley	bu.	620.38	692.37	917.38
Sell beef cow units	head	23.59	23.62	39.92
Sell 375 lb. heifers	head	54.81	52.68	
Sell aged sow	head		15.0	15.0
Buy corn grain	bu.			4,056.98
Buy alfalfa hay	ton			155.02

Activities in Year 8	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Wheat	acre	620.0	620.0	
Livestock Activities				
Beef cow herd	head	191.13	189.84	255.25
Wintering steers, 425-600 lbs.	head	87.92	87.33	117.41
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Pasture Activities				
Native pasture	acre	1,500.0	1,500.0	2,120.0
Short season tame pasture	acre	300.0	278.32	278.32
Full season tame pasture	acre		21.68	21.68
Purchase and Sale of Crops and Livestock				
Buy corn grain	bu.	382.27	3,379.68	3,510.29
Buy oats	bu.	764.54	1,209.35	1,470.99
Buy alfalfa hay	ton	96.68	100.52	133.6
Buy prairie hay	ton	163.31	172.02	279.24
Buy barley	bu.	703.37	698.6	939.31
Sell beef cow units	head	4.62		
Sell 375 lb. heifers	head	53.52	53.15	71.47
Buy beef cow units	head		1.69	5.96
Sell aged sow	head		15.0	15.0

Table 6-2. (continued)

Activities in Year 9	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Alfalfa hay	acre	65.0	99.15	
Prairie hay	acre	302.52	336.13	430.1
Wheat	acre	555.0	520.85	
Livestock Activities				
Beef cow herd	head	129.19	121.83	161.96
Wintering steers, 425-600 lbs.	head	59.43	56.04	74.5
Wintering heifers, 375-600 lbs.	head	36.17	34.11	45.35
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Ewe/lamb system producing fat lambs	head		177.93	177.93
Pasture Activities				
Native pasture	acre	1,197.48	1,163.87	1,689.9
Short season tame pasture	acre	300.0		
Full season tame pasture	acre		300.0	300.0
Purchase and Sale of Crops and Livestock				
Buy corn grain	bu.	547.76	4,406.2	4,576.36
Buy oats	bu.	1,023.18	1,414.9	1,732.73
Buy barley	bu.	475.42	448.34	596.02
Sell beef cow units	head	61.95	68.01	93.29
Sell aged sow	head		15.0	15.0
Buy alfalfa hay	ton			143.22

Activities in Year 10	Units	Strategy Number 1	2	4
		Number of Units		
Crop Activities				
Alfalfa hay	acre	48.64	49.37	
Prairie hay	acre	315.25	301.78	400.16
Barley	acre	571.36	570.63	
Livestock Activities				
Beef cow herd	head	153.86	147.28	195.3
Wintering and Summering steers, 425-825 lbs.	head	70.77	67.75	89.84
Sow/2-litter system producing feeder pigs	head		240.0	240.0
Sow/2-litter system producing and selling butcher pigs	head		240.0	240.0
Pasture Activities				
Native pasture	acre	1,184.75	1,198.22	1,719.84
Short season tame pasture	acre	83.06	73.48	5.78
Full season tame pasture	acre	216.94	226.52	294.22
Purchase and Sale of Crops and Livestock				
Buy corn grain	bu.	307.71	3,294.56	3,390.59
Buy oats	bu.	615.42	1,039.12	1,231.19
Sell barley	bu.	16,574.68	16,576.87	718.69
Buy beef cow units	head	24.67	25.45	33.34
Sell 375 lb. heifers	head	43.08	41.24	54.68
Sell aged sow	head		15.0	15.0
Buy alfalfa hay	ton			103.28

CHAPTER VII

A COMPARISON OF MODELS

The purpose of this chapter is to discuss not only the major results of all strategies evaluated, but also the implications of these results on the planning of the ranch organization under variable weather conditions.

Land Use

Except for the worst drought year of Models I and II (models including drought) pasture land was fully utilized in every year with every model. A land use program using 620 acres of cropland with 1,800 acres of pasture land resulted in greater total profit than a land use program consisting of 2,420 acres of pasture land and no cropland with every model. A rent pasture activity provided in the worst drought year of Models I and II was used to maintain the beef cow herd. The beef cow herd was reduced in size when annual forage costs per cow unit reached $103.60 with Model I and $106.90 with Model II. The beef cow herd was eliminated when annual forage costs per cow unit exceeded $121.60 with Model I and $154.90 with Model II. Purchase costs for cow herd replacements were assumed to be approximately $300 per cow unit. For details of annual purchase costs for beef cow units see Appendix A.

Livestock Program

The size of the beef cow herd exhibited much greater variability during ten-year periods including drought than during a ten-year period with no drought. The reduction in crop and pasture yields caused by the designed droughts in Models I and II forced the ranch operator to greatly reduce the size of the beef cow herd in the drought years of these models. When no designed drought periods were included in the ten-year period the beef cow herd remained relatively stable through most of the ten-year period. Herd size dropped sharply only in the ninth year because of unfavorable cattle prices.

When supplementary hog and sheep activities were included hog activities were almost always selected at the maximum allowable scale with every model. The diversification strategy with profits maximized in the worst year of the drought employed in the first year of Model I and the fourth year of Model II were the only instances when less than 240 pigs were farrowed. Sheep production was consistently selected in the ninth year of every model when included.

Capital Borrowing

Large amounts of capital borrowing were required during the drought and recovery in Models I and II. The

beef-crop-pasture strategy and the beef-hogs-sheep-pasture strategy required the greatest amounts of capital borrowing with the most frequency in all models. For example, the beef-hogs-sheep-pasture strategy required capital borrowing in four out of ten years when no drought occurred. It peaked at $21,990.28 worth of capital borrowing in the fifth year of the no-drought model. The beef-crop-pasture strategy required capital borrowing in five out of ten years when no drought occurred. It peaked at $24,963.66 worth of capital borrowing in the fifth year of the no-drought model.

The necessity of capital borrowing was an indicator of the length of the drought recovery period. In Model I, with designed drought in the first three years, capital borrowing was required through the sixth year. In Model II, with designed drought in the fourth, fifth and sixth years, capital borrowing was required through the seventh year. Generally, "high" prices combined with average yields in the seventh and eighth years shortened the recovery period in Model II.

Ranch Profits

For the purposes of this study profit was defined as total cash income from production activities less all production and fixed expenses. Annual living expenses and land payments were included in fixed expenses.

With every model the diversification strategy resulted in the greatest total ranch profit. With every model the beef-crop-pasture strategy and the beef-hogs-sheep-pasture strategy resulted in the least total ranch profit.

A breakdown of annual profits supported earlier statements concerning the length of the drought recovery in Models I and II. In Model I, with designed drought in the first three years, annual profits become greater than zero in dollar value in the sixth year with all strategies. In Model II, with designed drought in the fourth, fifth and sixth years, annual profits become greater than zero in dollar value in the seventh year with all strategies. The drought recovery was shortened in Model II.

The total ranch profit over a ten-year period for the beef-crop-pasture strategy in the no-drought model was $3,606.22. The total ranch profit over a ten-year period in both of the drought models was less than -$65,000.00. A ranch operation whose only livestock enterprise was beef production could make total ranch profits greater than zero in dollar value only during a planning period which included no drought given the restrictions and assumptions imposed by this study. It must be noted that management strategies which resulted in total ranch profits less than zero in dollar value might allow the ranch firm to survive if the repayment schedule on ranch land were adjusted.

A drought of the severity assumed in this study cost the ranch operator employing the diversification strategy at least $67,346.15 over a ten-year period.

Occurrence of Drought

When a drought occurs is an important consideration in organizing the ranch firm so as to withstand the effects of drought. Models I and II were constructed to measure the effects of drought on the ranch firm when it occurs in different time periods of a ten-year planning period. As noted earlier drought recovery was shortened with a drought occurring in the middle years rather than the beginning years of a planning period. Drought recovery with Model II was enhanced by the existence of "high" prices for average yields in the seventh and eighth years. A breakdown of annual profits and capital borrowing also indicated that when drought occurred in the middle years of a ten-year period cash flow accumulations reduced the necessity of capital borrowing both before and during the drought.

Although a ranch operator cannot know when a drought will occur, planning the organization with the expectation of drought and building up reserves of capital to provide additional cash flow when needed is important for the survival of the ranch firm.

Limitations of This Study and Suggestions for Further Study

The results of this study were subject to the restrictions and assumptions specified and imposed on the linear programming models. The results of the three models indicated possible consequences when certain strategies were employed. The results were valuable in providing criteria for evaluating the effectiveness of certain management strategies in maximizing profits for the ranch firm. Other factors affecting the decision of a ranch operator in selecting a livestock and land use program include: the type and slope of available land, the available buildings, facilities and equipment, the available capital, the level of management efficiency and the personal interests and desires of the ranch operator.

There is need for further research concerning the effects of differing levels of drought severity and length on a ranch firm. Research must be conducted to measure the effectiveness of other alternative management strategies not considered in this research. Study of the survival possibilities of smaller-sized ranches during planning periods including drought is necessary. Research concerning the capital growth of a ranch firm during a planning horizon including drought is also needed. Modification of the strategies employed in this study and their effect upon ranch profits may also be investigated. For example, what

would be the effect on ranch profits if beef cow numbers were stabilized rather than varied over a ten-year period.

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APPENDIX A

TABLE A-1

Livestock Budgets
Cow Calf Unit Budget, Feeder Calf Sold in October, Replacements First Calve as Two Year Olds, 92% Calf Crop, 16% Replacements Raised, 1 Bull Per 25 Cows

Receipts	Units	Quantity	Weight	Price	Value
(1) 425 lb. Str.	cwt.	.46	4.25		
375 lb. Hfr.	cwt.	.28	3.75		
600 lb. Hfr.	cwt.	.02	6.00	22.50	$ 2.70
Cull Cow	cwt.	.15	10.00	19.50	29.25
Total Receipts					31.95
Operating Expenses					
(2) Corn	Bu.	2.0			
Oats	Bu.	4.0			
Alfalfa	Ton	.4			
Prairie Hay	Ton	1.4			
Native Pasture	Aums	8.0			
Cattle Supp.	cwt.	1.6		7.50	12.00
Vet. Medicine	Cow	1.0		5.00	5.00
Haul. & Mktg.	Cow	1.0		4.00	4.00
Repairs					.96
(3) Total Direct Costs					21.96
Return Over Cash Costs					9.99

Labor Used	Hours
Jan - Feb	1.27
Mar - Apr	2.37
May - June	.95
July - Aug	.23
Sept - Oct	.52
Nov - Dec	1.27

(1) 425 lb. Steers and 375 lb. Heifers are transferred to separate selling activities.
(2) Corn, Oats, Alfalfa, Prairie Hay and Native Pasture transferred from separate production activities.
(3) Costs and returns vary as indicated in Tables A-3 and A-5.

TABLE A-1 (continued)

600 lb. Steer Budget, Wintering 6 Months, October to April, Gain 175 lbs., 1.5% Death Loss

Receipts	Unit	Quantity	Weight	Price	Value
600 lb. Str.	cwt.	.985	6.00	29.75	$175.82
Total Receipts					175.82
Operating Expenses					
(1) Barley	Bu.	8.0			
Alfalfa	Ton	.23			
Prairie Hay	Ton	.52			
Salt & Min.	lb.	8.0		.03	.24
Vet. Med.	cow	.35		5.00	1.75
Haul. & Mktg.	cow	1.5		4.00	6.00
Repairs					1.05
(2) Total Direct Costs					9.04
Return Over Cash Costs					166.78

Labor Used	Hours
Jan - Feb	1.0
Mar - Apr	.5
Sept - Oct	.5
Nov - Dec	1.0

(1) Barley, Alfalfa, Prairie Hay transferred from separate production activities.
(2) Costs and returns vary as indicated in Tables A-3 and A-5.

TABLE A-1 (continued)

600 lb. Heifer Budget, Wintering Heifer Calves, 5 Months, October to March, Gain 225 lbs., 1.5% Death Loss

Receipts	Unit	Quantity	Weight	Price	Value
600 lb. Hfr.	cwt.	.985	6.0	22.50	$132.98
Total Receipts					132.98
Operating Expenses					
(1) Corn	Bu.	8.0			
Oats	Bu.	14.0			
Alfalfa	Ton	.35			
Corn Silage	Ton	.6		20.00	12.00
Salt & Min.	lb.	9.0		.03	.27
Vet. Med.	cow	.4		5.00	2.00
Haul. & Mktg.	cow	1.5		4.00	6.00
Repairs					1.05
(2) Total Direct Costs					21.32
Return Over Cash Costs					111.66

Labor Used	Hours
Jan - Feb	1.4
Sept - Oct	.7
Nov - Dec	1.4

(1) Corn, Oats, and Alfalfa are transferred from separate production activities.
(2) Costs and returns vary as indicated in Tables A-3 and A-5.

TABLE A-1 (continued)

825 lb. Steer Budget, Wintering and Summer Grazing Steer Calves, 11.5 Months, October to Sept. 15, Gain 400 lbs., .5% Death Loss

Receipts	Unit	Quantity	Weight	Price	Value
825 lb. Str.	cwt.	.995	8.25	39.50	$324.25
Total Receipts					324.25
Operating Expenses					
(1) Barley	Bu.	8.0			
Alfalfa	Ton	.23			
Prairie Hay	Ton	.52			
Native Pasture	aum	3.85			
Salt & Min.	lbs.	20.0		.03	.60
Vet. Med.	cow	.7		5.00	3.50
Haul. & Mktg.	cow	3.0		4.00	12.00
Repairs					1.35
(2) Total Direct Costs					17.45
Return Over Cash Costs					306.80

Labor Used	Hours
Jan - Feb	1.0
Mar - Apr	.8
May - June	.6
July - Aug	.6
Sept - Oct	1.0
Nov - Dec	1.0

(1) Barley, Alfalfa, Prairie Hay and Native Pasture are transferred from separate production activities.
(2) Costs and returns vary as indicated in Tables A-3 and A-5.

TABLE A-1 (continued)

Feeder Pig Budget, Sow and Two Litters, 16 Feeder Pigs Sold Per Sow (1)

Operating Expenses	Unit	Quantity	Weight	Price	Value
Sow	cwt.	1.0		81.29	$ 81.29
Boar	cwt.	.04		162.59	6.50
(2) Corn	Bu.	40.0			
Oats	Bu.	30.0			
Creepration	cwt.	6.2		10.50	65.10
Alfalfa	Ton	.3			
Pasture	aums	.5			
Hog Supp.	cwt.	3.6		12.00	43.20
Salt & Min.	lbs.	50.0		.03	1.50
Vet. Med.	hd.	1.8		17.00	30.60
Haul. & Mktg.	hd.	2.0		4.00	8.00
Repairs					10.72
(3) Total Direct Costs					246.91

Labor Used	Hours
Jan - Feb	2.0
Mar - Apr	8.0
May - June	2.0
July - Aug	2.0
Sept - Oct	9.0
Nov - Dec	2.0

(1) Feeder pigs and sows are transferred to separate selling activities.
(2) Corn, Oats, Alfalfa, and Pasture are transferred from separate production activities.
(3) Costs vary as indicated in Table A-5.

TABLE A-1 (continued)

Butcher Pig Budget, 40 - 225 lbs., 1.5% Death Loss

Receipts	Unit	Quantity	Weight	Price	Value
Slaughter Hogs	cwt.	9.85	2.25	58.66	$1300.05
Total Receipts					1300.05
Operating Expenses					
(1)Corn	Bu.	100.0			
Pasture	aums	2.0			
Hog Supp.	cwt.	8.0		12.00	96.00
Salt & Min.	lbs.	70.0		.03	2.10
Vet. Med.	hd.	10.0		1.75	17.50
Haul. & Mktg.	hd.	5.25		4.00	21.00
Repairs					9.50
(2) Total Direct Costs					146.10
Return Over Cash Costs					1153.95
Labor Used		Hours			
Jan - Feb					
Mar - Apr		1.0			
May - June		2.0			
July - Aug		2.0			
Sept - Oct		1.0			
Nov - Dec					

(1) Corn and Pasture transferred from separate production activities.
(2) Costs and returns vary as indicated in Tables A-3 and A-5.

TABLE A-1 (continued)

Fat Lamb Budget, Sell 120% Lamb Crop, July Fat Lambs, 20% Replacement Ewes Purchased, 2% Ewe Death Loss

Receipts	Unit	Quantity	Weight	Price	Value
Slaughter Lambs	cwt.	1.2	.90	43.75	$47.25
Lamb Wool Incent	cwt.	1.2	.90	1.09	1.18
Wool	lbs.	1.0	10.0	.43	4.30
Wool Support	lbs.	1.0	10.0	.29	2.90
Cull Ewes	cwt.	.18	1.3	9.75	2.28
Total Receipts					57.91
Operating Expenses					
(1) Corn	Bu.	5.0			
Alfalfa	Ton	.23			
Prairie Hay	Ton	.2			
Pasture	aum	1.0			
Sheep Supp	cwt.	.25		8.15	2.04
Salt & Min.	lbs.	16.0		.03	.48
Replacem't Ewe	hd.	.2		25.00	5.00
Vet. Med.	hd.	.25		17.00	4.25
Shearing	hd.	1.0		1.00	1.00
Haul, & Mktg.	hd.	.35		4.00	1.40
Repairs					.52
(2) Total Direct Costs					14.69
Return Over Cash Costs					43.22

Labor Used	Hours
Jan - Feb	.32
Mar - Apr	1.4
May - June	.32
July - Aug	.32
Sept - Oct	.32
Nov - Dec	.32

(1) Corn, Alfalfa, Prairie Hay, and Pasture are transferred from separate production activities.
(2) Costs and returns vary as indicated in Tables A-3 and A-5.

TABLE A-2

Crop Budgets
Prairie Hay Crop Budget

Receipts	Unit	Quantity	Price	Value
(1) Prairie Hay	Ton	.8	0.0	0.0
Total Receipts				0.0

Machine Costs 1. Harvest Operations	Times Over	Once Over Cost / Acre	Total Tractor Hrs/Acre	Cost/ Acre
Swather	1.2	3.34914		$ 4.02
Baler	.4	9.99287	.4	4.00
Bale Wagon	.4	8.64192	.4	3.45
Total Harvest Costs				11.47

2. Tractor Costs	Total Tractor Hours	Repair Cost/Hour	Fixed Cost/Hour	Cost/ Acre
80 HP. Diesel	.8	1.13412		.91
80 HP. Diesel	.8		3.3759	2.70

Other Costs	
Pest Control	1,35
Fertilizer	6.75
General Overhead	3.00
(2) Total Production Costs	26.18

Labor Used	Hours
May - June	1.02
July - Aug	.24

(1) Prairie hay is transferred to separate production activities and production varies as indicated in Tables A-9, A-10, and A-11.
(2) Production costs will vary as indicated in Tables A-6, A-7, and A-8.

TABLE A-2 (continued)

Alfalfa Hay Crop Production

Receipts	Unit	Quantity	Price	Value
(1) Alfalfa Hay	Ton	1.6	0.0	0.0
Total Receipts				0.0

Machine Costs

1. Pre-Harvest Operations	Times Over	Once Over Cost/Acre	Total Tractor Hrs/Acre	Cost/ Acre
Plow	.125	2.04816	.04276	$ .26
Tandem Disk	.125	.84312	.01726	.10
Spike Harrow	.125	.20778	.01158	.02
Drill	.125	2.55688	.01896	.32
2. Harvest Operations				
Swather	1.2	3.34914		4.02
Baler	.4	9.99287	.4	4.00
Bale Wagon	.4	8.64192	.4	3.46

3. Tractor Costs	Total Tractor Hours	Repair Cost/Hour	Fixed Cost/Hour	Cost/ Acre
80 HP. Diesel	.89056	1.13412		1.01
80 HP. Diesel	.89056		3.3759	3.01

Other Costs	
Seed	.22
Pest Control	1.35
Fertilizer	6.75
General Overhead	3.00
(2) Total Production Costs	27.52

Labor Used	Hours
May - June	1.1
July - Aug	.25

(1) Alfalfa hay is transferred to separate production activities and production varies as indicated in Tables A-9, A-10, and A-11.
(2) Production costs vary as indicated in Tables A-6, A-7, and A-8.

TABLE A-2 (continued)

Oats Crop Budget

Receipts	Unit	Quantity	Price	Value
(1) Oats	Bu.	41.0	0.0	0.0
Total Receipts				0.0

Machine Costs 1. Pre-Harvest Operations	Times Over	Once Over Cost/Acre	Total Tractor Hrs/Acre	Cost/ Acre
Chisel	1.	1.0	.2096	$1.00
Tandem Disk	1.	.84312	.13805	.84
Spike Harrow	1.	.20778	.09266	.21
Drill	1.	2.55688	.15165	2.56
2. Harvest Operations				
Truck	.5	2.70115		1.35
Swather	1.	3.34914		3.35
Combine	1.	8.23566		8.24
Baler	.1	9.99287	.1	1.00
Bale Wagon	.1	8.64192	.1	.86

3. Tractor Costs	Total Tractor Hours	Repair Cost/Hour	Fixed Cost/Hour	Cost/ Acre
80 HP. Diesel	.79196	1.13412		.90
80 HP. Diesel	.79196		3.3759	2.67

Other Costs	
Grain Storage	1.07
Seed	5.63
Weed Control	.97
Pest Control	.90
Insurance	2.50
Fertilizer	10.00
General Overhead	3.00
(2) Total Production Costs	47.05

Labor Used	Hours
May - June	.46
July - Aug	1.47
Sept - Oct	.25

(1) Oats is transferred to separate production activities and production varies as indicated in Tables A-9, A-10, and A-11.
(2) Production costs vary as indicated in Tables A-6, A-7, and A-8.

TABLE A-2 (continued)

Barley Crop Budget

Receipts	Unit	Quantity	Price	Value
(1) Barley	Bu.	30.0	0.0	0.0
Total Receipts				0.0

Machine Costs 1. Pre-Harvest Operations	Times Over	Once Over Cost/Acre	Total Tractor Hrs/Acre	Cost/ Acre
Chisel	1.	1.00	.2096	$1.00
Tandem Disk	1.	.84312	.13805	.84
Spike Harrow	1.	.20778	.09266	.21
Drill	1.	2.55688	.15165	2.56
2. Harvest Operations				
Swather	1.	3.34914		3.35
Combine	1.	8.23566		8.24
Truck	.5	2.70115		1.35

3. Tractor Costs	Total Tractor Hours	Repair Cost/Hour	Fixed Cost/Hour	Cost/ Acre
80 HP. Diesel	.59196	1.13412		.67
80 HP. Diesel	.59196		3.3759	1.99

Other Costs	
Grain Storage	.97
Seed	4.74
Weed Control	2.14
Pest Control	.90
Insurance	2.50
Fertilizer	12.20
General Overhead	3.00
(2) Total Production Costs	46.66

Labor Used	Hours
May - June	.46
July - Aug	1.22
Sept - Oct	.25

(1) Barley is transferred to separate production activities and production varies as indicated in Tables A-9, A-10, and A-11.
(2) Production costs vary as indicated in Tables A-6, A-7, and A-8.

TABLE A-2 (continued)

Corn Grain Budget

Receipts	Unit	Quantity	Price	Value
(1) Corn	Bu.	25.0	0.0	0.0
Total Receipts				0.0

Machine Costs 1. Pre-Harvest Operations	Times Over	Once Over Cost/Acre	Total Tractor Hrs/Acre	Cost/ Acre
Plow	1.0	2.04816	.34204	$2.05
Tandem Disk	1.0	.84312	.13805	.84
Spike Harrow	1.0	.20778	.09266	.21
Cyclo-Planter	1.0	2.17843	.13736	2.18
Cultivator	1.4	.85244	.30764	1.19
2. Harvest Operations				
Combine	1.0	10.47241		10.47
Truck	.5	2.70115		1.35
Stalk Shredder	1.0	1.35981	.16975	1.36

3. Tractor Costs	Total Tractor Hours	Repair Cost/Hour	Fixed Cost/Hour	Cost/ Acre
80 HP. Diesel	1.1875	1.13412		1.35
80 HP. Diesel	1.1875		3.3759	4.01

Other Costs	
Storage and Drying	4.72
Seed	6.02
Weed Control	3.37
Pest Control	4.29
Insurance	2.50
Fertilizer	14.40
General Overhead	3.00
(2) Total Production Costs	63.31

Labor Used	Hours
May - June	.8
Sept - Oct	1.6

(1) Corn is transferred to separate production activities and production varies as indicated in Tables A-9, A-10, and A-11.
(2) Production costs vary as indicated in Tables A-6, A-7, and A-8.

TABLE A-2 (continued)

Rye Crop Budget

Receipts	Unit	Quantity	Price	Value
(1) Rye	Bu.	26.0	2.35	$61.10
Total Receipts				61.10

Machine Costs 1. Pre-Harvest Operations	Times Over	Once Over Cost/Acre	Total Tractor Hrs/Acre	Cost/ Acre
Chisel	1.	1.0	.2096	$ 1.00
Tandem Disk	1.	.84312	.13805	.84
Spike Harrow	1.	.20778	.09266	.21
Drill	1.	2.55688	.15165	2.56
2. Harvest Operations				
Swather	1.	3.34914		3.35
Combine	1.	8.23566		8.24
Truck	.5	2.70115		1.35

3. Tractor Costs	Total Tractor Hours	Repair Cost/Hour	Fixed Cost/Hour	Cost/ Acre
80 HP. Diesel	.59196	1.13412		.67
80 HP. Diesel	.59196		3.3759	1.99

Other Costs	
Storage and Drying	.75
Seed	3.55
Weed Control	.26
Pest Control	.45
Insurance	2.50
Fertilizer	12.20
General Overhead	3.00
(2) Total Production Costs	42.92
Return Over Production Costs	18.18

Labor Used	Hours
May - June	.46
July - Aug	1.22
Sept - Oct	.25

(1) Rye production varies as indicated in Tables A-9, A-10, and A-11.
(2) Production costs and returns vary as indicated in Tables A-4, A-6, A-7, and A-8.

TABLE A-2 (continued)

Wheat Crop Budget

Receipts	Unit	Quantity	Price	Value
(1) Wheat	Bu.	19.1	3.96	$75.64
Total Receipts				75.64

Machine Costs 1. Pre-Harvest Operations	Times Over	Once Over Cost/Acre	Total Tractor Hrs/Acre	Cost/ Acre
Chisel	1.	1.0	.2096	$ 1.00
Tandem Disk	1.	.84312	.13805	.84
Spike Harrow	1.	.20778	.09266	.21
Drill	1.	2.55688	.15165	2.56
2. Harvest Operations				
Swather	1.	3.34914		3.35
Combine	1.	8.23566		8.24
Truck	.5	2.70115		1.35

3. Tractor Costs	Total Tractor Hours	Repair Cost/Hour	Fixed Cost/Hour	Cost/ Acre
80 HP. Diesel	.59196	1.13412		.67
80 HP. Diesel	.59196		3.3759	1.99

Other Costs	
Grain Storage	.57
Seed	6.04
Weed Control	2.49
Pest Control	.90
Insurance	2.50
Fertilizer	11.10
General Overhead	3.00
(2)Total Production Costs	46.81
Returns Over Production Costs	28.83

Labor Used	Hours
May - June	.46
July - Aug	1.22
Sept - Oct	.25

(1) Wheat production varies as indicated in Tables A-9, A-10, and A-11.
(2) Production costs and returns vary as indicated in Tables A-4, A-6, A-7, and A-8.

TABLE A-3

Returns Over Production Costs Per Unit (1) for Livestock Enterprises

Year	(2) Cow Calf	600 lb. Steers	600 lb. Heifers	825 lb. Steers	Fat Lambs	Feeder Pigs (3)	Butcher Pigs
1	$17.37	$155.52	$148.52	$205.61	$26.33	$-113.19	$ 477.09
2	17.35	162.87	133.67	203.48	31.04	-106.74	370.71
3	17.81	150.93	133.37	211.45	31.14	-108.33	376.71
4	18.16	180.15	141.47	237.50	34.92	-121.27	510.60
5	22.81	202.15	169.17	245.39	33.80	-124.15	389.39
6	21.96	196.07	174.69	263.54	34.04	-118.53	325.57
7	28.81	226.82	194.69	334.83	36.84	-137.17	566.50
8	38.14	323.81	257.78	409.58	42.00	-176.68	1029.78
9	11.59	266.39	221.09	232.28	44.05	-190.88	727.38
10	9.99	166.78	111.66	306.80	43.22	-246.91	1153.95

(1) Cow calf, 600 lb. steers, heifers, 825 lb. steers and fat lambs are sold in units of one head. Feeder pigs are produced in units of 16 head. Butcher pigs are sold in units of 10 head.
(2) 425 lb. steers and 375 lb. heifers are transferred from this unit to separate selling activities listed in Table A-17.
(3) 40 lb. feeder pigs are transferred from this unit to separate selling activities listed in Table A-18.

TABLE A-4

Returns Over Production Costs for Cash Crop Enterprises Per Acre

	Model I		Model II		Model III	
Year	Wheat	Rye	Wheat	Rye	Wheat	Rye
1	$ 4.08	$ 5.52	$ 3.08	$ 6.01	$ 3.08	$ 6.01
2	-7.18	-5.02	12.56	16.10	12.56	16.10
3	-6.79	-13.97	9.49	10.03	9.49	10.03
4	.56	.06	-3.11	1.44	.56	.06
5	4.15	10.79	-9.96	-8.53	4.15	10.79
6	13.17	8.48	-9.84	-16.14	13.17	8.48
7	12.04	5.41	12.04	5.41	12.04	5.41
8	46.25	40.95	46.25	40.95	46.25	40.95
9	27.91	10.27	27.91	10.27	27.91	10.27
10	28.83	18.18	28.83	18.18	28.83	18.18

TABLE A-5

Production Cost Per Unit for Livestock Enterprises

Year	Cow Calf	600 lb. Steers	600 lb. Heifers	825 lb. Steers	Fat Lambs	Feeder Pigs	Butcher Pigs
1	$ 9.84	$4.05	$ 9.55	$ 7.82	$ 6.58	$113.19	$ 65.45
2	9.94	4.09	9.65	7.90	6.65	106.74	66.11
3	10.23	4.21	9.94	8.13	6.85	108.33	68.09
4	11.03	4.54	10.71	8.76	7.38	121.27	73.38
5	11.43	4.70	11.09	9.08	7.64	124.15	76.02
6	11.82	4.87	11.48	9.40	7.91	118.53	78.67
7	12.52	5.15	12.16	9.94	8.38	137.17	83.30
8	14.51	5.97	14.08	11.53	9.70	176.68	96.52
9	17.59	7.24	17.08	13.98	11.77	190.88	117.01
10	21.96	9.04	21.32	17.45	14.69	246.91	146.10
Unit	head	head	head	head	head	16 head	10 head

TABLE A-6

Production Costs Per Acre for All Crop Enterprises in Model I

Year	Corn	Oats	Alfalfa	Prairie Hay	Barley	Wheat	Rye
1	$28.36	$21.08	$12.33	$11.73	$20.90	$20.97	$19.23
2	20.65	21.29	12.45	11.85	15.11	21.18	19.42
3	10.56	15.03	5.79	5.17	5.22	6.79	13.97
4	31.80	23.63	13.82	13.15	23.44	23.51	21.56
5	32.94	24.48	14.32	13.62	24.28	24.36	22.33
6	34.09	25.33	14.82	14.10	25.12	25.21	23.11
7	36.10	26.82	15.69	14.93	26.60	26.69	24.47
8	41.82	31.08	18.18	17.30	30.83	30.92	28.35
9	50.71	37.68	22.04	20.97	37.37	37.49	34.37
10	63.31	47.05	27.52	26.18	46.66	46.81	42.92

TABLE A-7

Production Costs Per Acre for All Crop Enterprises in Model II

Year	Corn	Oats	Alfalfa	Prairie Hay	Barley	Wheat	Rye
1	$28.36	$21.08	$12.33	$11.73	$20.90	$20.97	$19.23
2	28.65	21.29	12.45	11.85	21.11	21.18	19.42
3	29.51	21.93	12.83	12.20	21.75	21.82	20.00
4	31.80	23.63	13.82	13.15	23.44	23.51	21.56
5	24.19	24.48	14.32	13.62	18.88	24.36	22.33
6	12.58	16.88	6.69	5.98	8.36	9.84	16.14
7	36.10	26.82	15.69	14.93	26.60	26.69	24.47
8	41.82	31.08	18.18	17.30	30.83	30.92	28.35
9	50.71	37.68	22.04	20.97	37.37	37.49	34.37
10	63.31	42.05	27.52	26.18	46.66	46.81	42.92

TABLE A-8

Production Costs Per Acre for All Crop Enterprises in Model III

Year	Corn	Oats	Alfalfa	Prairie Hay	Barley	Wheat	Rye
1	$28.36	$21.08	$12.33	$11.73	$20.90	$20.97	$19.23
2	28.65	21.29	12.45	11.85	21.11	21.18	19.42
3	29.51	21.93	12.83	12.20	21.75	21.82	20.00
4	31.80	23.63	13.82	13.15	23.44	23.51	21.56
5	32.94	24.48	14.32	13.62	24.28	24.36	22.33
6	34.09	25.33	14.82	14.10	25.12	25.21	23.11
7	36.10	26.82	15.69	14.93	26.60	26.69	24.47
8	41.82	31.08	18.18	17.30	30.83	30.92	28.35
9	50.71	37.68	22.04	20.97	37.37	37.49	34.37
10	63.31	47.05	27.52	26.18	46.66	46.81	42.92

TABLE A-9

Yield Pattern per Acre for Crop Enterprises in Model I

Year	Corn	Oats	Alfalfa	Prairie Hay	Barley	Wheat	Rye
1	25.0	30.0	1.0	.75	25.0	15.0	25.0
2	15.0	20.0	.5	.5	15.0	10.0	15.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	39.0	44.0	1.8	.9	28.0	17.7	23.5
5	34.0	43.5	1.75	.9	31.0	19.8	36.0
6	25.0	60.0	1.3	.8	44.5	29.3	39.0
7	51.0	50.0	1.6	.9	37.0	21.4	36.0
8	31.0	34.0	.9	.7	30.0	18.2	35.0
9	17.0	24.0	1.2	.7	14.0	15.0	18.0
10	25.0	41.0	1.6	.8	30.0	19.1	26.0
Unit	Bu.	Bu.	Ton	Ton	Bu.	Bu.	Bu.

TABLE A-10

Yield Pattern per Acre for Crop Enterprises in Model II

Year	Corn	Oats	Alfalfa	Prairie Hay	Barley	Wheat	Rye
1	45.0	26.5	1.25	.75	23.5	14.4	25.5
2	26.0	50.0	1.45	.9	44.0	24.1	37.0
3	46.0	56.5	1.75	.95	38.0	23.9	33.0
4	25.0	30.0	1.0	.75	25.0	15.0	25.0
5	15.0	20.0	.5	.5	15.0	10.0	15.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	51.0	50.0	1.6	.9	37.0	21.4	36.0
8	31.0	34.0	.9	.7	30.0	18.2	35.0
9	17.0	24.0	1.2	.7	14.0	15.0	18.0
10	25.0	41.0	1.6	.8	37.0	19.1	26.0
Unit	Bu.	Bu.	Ton	Ton	Bu.	Bu.	Bu.

TABLE A-11

Yield Pattern per Acre for Crop Enterprises in Model III

Year	Corn	Oats	Alfalfa	Prairie Hay	Barley	Wheat	Rye
1	45.0	26.5	1.25	.75	23.5	14.4	25.5
2	25.0	50.0	1.45	.9	41.0	21.1	37.0
3	46.0	56.5	1.75	.95	38.0	23.9	33.0
4	39.0	44.0	1.8	.9	28.0	17.7	23.5
5	34.0	43.5	1.75	.9	31.0	19.8	36.0
6	25.0	60.0	1.3	.8	44.5	29.3	39.0
7	51.0	50.0	1.6	.9	37.0	21.4	36.0
8	31.0	34.0	.9	.7	30.0	18.2	35.0
9	17.0	24.0	1.2	.7	14.0	15.0	18.0
10	25.0	41.0	1.6	.8	30.0	19.1	26.0
Unit	Bu.	Bu.	Ton	Ton	Bu.	Bu.	Bu.

TABLE A-12

Aum Distribution for Three Pasture Systems in Model I

Native Pasture

Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15										
May 16-July 15	.266	.177		.305	.287	.394	.339	.383	.391	.328
July 16-Aug 31	.205	.137		.239	.225	.309	.265	.300	.307	.257
Sept 1-Oct 31	.266	.186		.310	.292	.401	.346	.307	.222	.333
Nov 1-Apr 15	.013			.035	.076	.086				.082

Short Season Tame Pasture

Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15										
May 16-July 15	.392	.300		.433	.665	.533	.548	.552	.443	.532
July 16-Aug 31	.362	.271		.392	.601	.482	.496	.499	.400	.481
Sept 1-Oct 31	.246	.179		.175	.524	.195	.316	.319	.367	.297
Nov 1-Apr 15										

Full Season Tame Pasture

Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15	.155	.093	.093	.199	.222	.245	.246	.173	.210	.199
May 16-July 15	.393	.236		.506	.565	.623	.626	.440	.535	.506
July 16-Aug 31	.303	.181		.389	.435	.480	.482	.339	.412	.389
Sept 1-Oct 31	.399	.240		.506	.528	.592	.626	.318	.333	.506
Nov 1-Apr 15				.100						.100

TABLE A-13

Aum Distribution for Three Pasture Systems in Model II

Native Pasture

Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15										
May 16-July 15	.328	.328	.308	.266	.177		.339	.383	.391	.328
July 16-Aug 31	.257	.257	.241	.205	.137		.265	.300	.307	.257
Sept 1-Oct 31	.333	.333	.313	.266	.186		.346	.307	.222	.333
Nov 1-Apr 15	.082	.082	.118	.013						.082

Short Season Tame Pasture

Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15										
May 16-July 15	.532	.532	.528	.392	.300		.548	.552	.443	.532
July 16-Aug 31	.481	.481	.477	.362	.271		.496	.499	.400	.481
Sept 1-Oct 31	.297	.297	.355	.246	.179		.316	.319	.367	.297
Nov 1-Apr 15										

Full Season Tame Pasture

Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15	.199	.182	.208	.155	.093	.093	.246	.173	.210	.199
May 16-July 15	.506	.464	.530	.393	.236		.626	.440	.535	.506
July 16-Aug 31	.389	.357	.408	.303	.181		.482	.339	.412	.389
Sept 1-Oct 31	.506	.464	.530	.399	.240		.626	.318	.333	.506
Nov 1-Apr 15	.100	.053	.304				.010			.100

TABLE A-14

Aum Distribution for Three Pasture Systems in Model III

Native Pasture										
Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15										
May 16-July 15	.328	.328	.308	.305	.287	.394	.339	.383	.391	.328
July 16-Aug 31	.257	.257	.241	.239	.225	.309	.265	.300	.307	.257
Sept 1-Oct 31	.333	.333	.313	.310	.292	.401	.346	.307	.222	.333
Nov 1-Apr 15	.082	.082	.118	.035	.076	.086				.082

Short Season Tame Pasture										
Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15										
May 16-July 15	.532	.532	.528	.433	.665	.533	.548	.552	.443	.532
July 16-Aug 31	.481	.481	.477	.392	.601	.482	.496	.499	.400	.481
Sept 1-Oct 31	.297	.297	.355	.175	.524	.195	.316	.319	.367	.297
Nov 1-Apr 15										

Full Season Tame Pasture										
Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Apr 16-May 15	.199	.182	.208	.199	.222	.245	.246	.173	.210	.199
May 16-July 15	.506	.464	.530	.506	.565	.623	.626	.440	.535	.506
July 16-Aug 31	.389	.357	.408	.389	.435	.480	.482	.339	.412	.389
Sept 1-Oct 31	.506	.464	.530	.506	.528	.592	.626	.318	.333	.506
Nov 1-Apr 15	.100	.053	.304	.100			.010			.100

TABLE A-15

Annual Costs Per Acre for Three Pasture Systems

	Native Pasture	Short Season Tame Pasture	Short Season Tame Pasture w/Hay	Full Season Tame Pasture	Rented Native Pasture
Annual Cost	$.75	$1.62	$6.31	$5.55	$8.50

TABLE A-16

Selling Price per Bushel for Crop Enterprises

Year	Corn	Oats	Barley	Wheat	Rye
1	$1.18	$ .61	$ .96	$1.67	$ .99
2	1.04	.60	.94	1.40	.96
3	1.04	.56	.85	1.31	.91
4	1.03	.55	.79	1.36	.92
5	1.21	.57	.84	1.44	.92
6	1.05	.54	.80	1.31	.81
7	1.37	.66	.96	1.81	.83
8	2.37	1.11	1.85	4.24	1.98
9	3.05	1.48	2.56	4.36	2.48
10	2.45	1.45	2.35	3.96	2.35

Source: South Dakota Crop and Livestock Reporting Service

TABLE A-17

Selling Price Per Hundred-weight for Livestock Production

Year	425 lb Steers	375 lb Heifers	600 lb Steers	600 lb Heifers	825 lb Steers	Cull Cows	90 lb Lambs
1	$32.00	$28.00	$27.00	$26.75	$26.00	$16.00	$22.85
2	31.25	27.50	28.25	24.25	25.75	16.25	26.75
3	32.00	28.00	26.25	24.25	26.75	16.75	26.94
4	35.50	32.00	31.25	25.75	30.00	17.40	30.12
5	38.75	34.50	35.00	30.50	31.00	20.25	28.78
6	39.50	35.00	34.00	31.50	33.25	20.00	29.05
7	50.00	43.75	39.25	35.00	42.00	24.75	32.75
8	64.90	68.75	55.80	46.00	51.30	31.60	37.12
9	31.00	28.50	46.30	40.30	30.00	17.65	43.20
10	34.00	29.25	29.75	22.50	39.50	19.50	43.75

Source: South Dakota Crop and Livestock Reporting Service

TABLE A-18

Selling Price per Unit for Livestock Production

Year	Cull Ewes	Wool	Wool Support	Wool Incentive	Feeder Pigs	Butcher Hogs	Aged Sows	Beef Cow Units
1	$5.00	$.56	$.09	$ .52	$18.36	$24.48	$20.95	$263.31
2	4.56	.42	.24	1.05	14.78	19.71	16.75	262.14
3	4.50	.41	.26	1.06	15.05	20.07	16.81	277.43
4	7.25	.42	.27	1.09	19.75	26.35	23.90	306.86
5	6.75	.36	.36	1.46	15.88	21.00	16.62	315.08
6	4.75	.22	.50	2.10	13.68	18.24	15.52	339.80
7	4.50	.38	.34	1.48	26.62	29.32	25.60	392.76
8	9.00	.95	0.00	0.00	37.10	50.82	46.85	502.20
9	6.00	.61	.11	.52	28.18	38.10	31.30	429.24
10	9.75	.43	.29	1.09	48.13	58.66	52.31	403.35
Unit	cwt.	lb.	lb.	cwt.	head	cwt.	cwt.	head

Source: South Dakota Crop and Livestock Reporting Service

TABLE A-19

Purchase Price for Feed Crops and Beef Cow Units

Year	Corn	Oats	Alfalfa	Prairie Hay	Barley	Beef Cow Units
1	$1.23	$ .66	$27.00	$22.00	$1.01	
2	1.09	.65	26.00	21.00	.99	$267.14
3	1.09	.61	27.00	22.00	.90	282.43
4	1.08	.60	26.50	21.50	.84	311.86
5	1.26	.62	25.50	20.50	.89	320.08
6	1.10	.59	25.50	20.50	.85	344.80
7	1.42	.71	25.50	20.50	1.01	397.76
8	2.42	1.16	40.50	35.50	1.90	507.20
9	3.10	1.53	54.50	49.50	2.61	434.24
10	2.50	1.50	51.50	46.50	2.40	408.35
Unit	Bu.	Bu.	Ton	Ton	Bu.	Head

TABLE A-20

Price per Head for Livestock Investment Associated with Livestock Enterprises

Year	Beef Cow	Beef Heifer	Grade Beef Bull	Sow	Boar	Ewe	Ram
1	$220.44	$173.20	$503.87	$38.81	$ 77.62	$15.00	$21.43
2	219.48	172.44	501.66	32.17	64.34	14.72	21.03
3	232.04	182.32	530.39	31.64	63.29	15.56	22.22
4	256.22	201.31	585.64	38.29	76.57	18.61	26.59
5	262.98	206.63	601.10	38.29	76.57	17.50	25.00
6	283.29	222.58	647.51	30.42	60.84	15.00	21.43
7	326.80	256.77	746.96	43.01	86.01	15.56	22.22
8	416.71	327.42	952.49	66.26	132.52	29.44	42.06
9	356.77	280.32	815.47	58.74	117.48	25.56	36.51
10	335.50	263.60	766.85	81.29	162.59	24.17	34.52

TABLE A-21

Capital Investment Requirements for Livestock Enterprises

Year	Cow Calf	Fat Lambs	Feeder Pigs
1	$268.31	$15.86	$41.91
2	267.14	15.56	34.74
3	282.43	16.45	34.17
4	311.86	19.67	41.35
5	320.08	18.50	41.35
6	344.80	15.86	32.85
7	397.76	16.45	46.45
8	507.20	31.12	71.56
9	434.24	27.02	63.44
10	408.35	25.55	87.79

TABLE A-22

Annual Fixed Costs

Year	Other Fixed Expenses	Living Expenses	Land Payments	Total
1	$7520.00	$ 7200.00	$14520.00	$29240.00
2	7745.60	7632.00	14520.00	29897.60
3	7977.97	8089.92	14520.00	30587.89
4	8217.31	8575.31	14520.00	31312.62
5	8463.83	9089.83	14520.00	32073.66
6	8717.74	9635.23	14520.00	32872.97
7	8979.27	10213.34	14520.00	33712.61
8	9248.65	10826.14	14520.00	34594.79
9	9526.11	11475.71	14520.00	35521.82
10	9811.89	12164.25	14520.00	36496.14

TABLE A-23

Distribution of Pasture Aum's for Enterprises Requiring Pasture

Time Period	Cow Calf	825 lb Steers	Fat Lambs	Feeder Pigs	Butcher Pigs
Apr 16-May 15		.61	.333	.25	
May 16-July 15	2.91	1.34	.667		1.14
July 16-Aug 31	2.18	1.11			.86
Sept 1-Oct 31	2.91	.79		.25	
Nov 1-Apr 15					

TABLE A-24

Interest Rates for Non-Real Estate Loans from Commercial Banks and PCA's

Year	1	2	3	4	5	6	7	8	9	10
Interest Rate (%)	6.83	7.09	7.33	7.8	8.38	7.73	7.57	8.3	9.26	8.8

TABLE A-25

Enterprises Considered Over a Ten Year Period for a 2560 Acre Ranch

Description	Unit	Activity Numbers
Growing Corn	Acre	101, 201, 301, 401, 501, 601, 701, 801, 901, 1001
Growing Oats	Acre	102, 202, 302, 402, 502, 602, 702, 802, 902, 1002
Growing Alfalfa	Acre	103, 203, ...1003
Growing Prairie Hay	Acre	104, 204, ...1004
Growing Barley	Acre	105, 205, ...1005
Growing and Selling Wheat	Acre	106, 206, ...1006
Growing and Selling Rye	Acre	107, 207, ...1007
Beef Cow Calf Unit, Calf Raising	Head	108, 208, ...1008
Wintering Steer Calves, Sold @ 600 lbs.	Head	109, 209, ...1009
Wintering Heifer Calves, Sold @ 600 lbs.	Head	110, 210, ...1010
Wintering and Summering Steers, Sold @ 825 lbs.	Head	111, 211, ...1011
Producing 40 lb. Feeder Pigs	16 Head	112, 212, ...1012
Raising and Selling Butcher Hogs	10 Head	113, 213, ...1013
Raising and Selling July Fat Lambs	Head	114, 214, ...1014
Sell Corn	Bu.	115, 215, ...1015
Buy Corn	Bu.	116, 216, ...1016
Sell Oats	Bu.	117, 217, ...1017
Buy Oats	Bu.	118, 218, ...1018

TABLE A-25 (continued)

Description	Unit	Activity Numbers
Buy Alfalfa Hay	Ton	119, 219, 319, 419, 519, 619, 719, 819, 919, 1019
Buy Prairie Hay	Ton	120, 220, 320, 420, 520, 620, 720, 820, 920, 1020
Sell Barley	Bu.	121, 221, ...1021
Buy Barley	Bu.	122, 222, ...1022
Sell Beef Cow Unit	Head	223, 323, 423, 523, 623, 723, 823, 923
Buy Beef Cow Unit	Head	224, 324, 424, 524, 624, 724, 824, 924, 1024
Fixed Expenses	Dol.	125, 225, 325, 425, 525, 625, 725, 825, 925, 1025
Borrow Capital	Dol.	126, 226, 326, 426, 526, 626, 726, 826, 926, 1026
Native Pasture System	Acre	127, 227, ...1027
Short Season Tame Pasture	Acre	128, 228, ...1028
Full Season Tame Pasture	Acre	129, 229, ...1029
Rent Pasture	Acre	330, 630.
Sell 375 Lb. Heifers	Head	131, 231, 331, 431, 531, 631, 731, 831, 931, 1031
Sell 425 lb. Steers	Head	132, 232, 332, 432, 532, 632, 732, 832, 932, 1032
Sell 40 lb. Feeder Pigs	Head	133, 233, ...1033
Sell Aged Sow	Head	134, 234, ...1034

TABLE A-26

Restrictions Imposed Over a Ten Year Period for a 2560 Acre Ranch

Description	Unit	Row Number
Native Pasture	Acre	101, 201, 301, 401, 501, 601, 701, 801, 901, 1001
Crop Land	Acre	102, 202, 302, 402, 502, 602, 702, 802, 902, 1002
Beef Cow Unit Transfer	Head	103, 203, ...1003
January - February Labor	Hour	104, 204, ...1004
March - April Labor	Hour	105, 205, ...1005
May - June Labor	Hour	106, 206, ...1006
July - August Labor	Hour	107, 207, ...1007
September - October Labor	Hour	108, 208, ...1008
November - December Labor	Hour	109, 209, ...1009
Corn Transfer	Bu.	110, 210, ...1010
Oats Transfer	Bu.	111, 211, ...1011
Barley Transfer	Bu.	112, 212, ...1012
Alfalfa Transfer	Ton	113, 213, ...1013
Prairie Hay Transfer	Ton	114, 214, ...1014
425 lb. Steer Transfer	Head	115, 215, ...1015
375 lb. Heifer Transfer	Head	116, 216, ...1016
Operating Capital	Dol.	117, 217, ...1017
Cash Flow	Dol.	118, 218, ...1018
Total Fixed Expenses	Dol.	119, 219, ...1019
Cash Flow Transfer	Dol.	120, 220, ...1020
Livestock Investment Capital	Dol.	121, 221, ...1021

TABLE A-26 (continued)

Description	Unit	Row Number
Aum's Grazing Transfer		
April 16 - May 15	Aum	122, 222, 322, 422, 522, 622, 722, 822, 922, 1022
May 16 - July 15	Aum	123, 223, 323, 423, 523, 623, 723, 823, 923, 1023
July 16 - August 31	Aum	124, 224, ...1024
September 1 - October 31	Aum	125, 225, ...1025
November 1 - April 15	Aum	126, 226, ...1026
Feeder Pig Transfer	Head	127, 227, ...1027
Tame Pasture	Acre	128, 228, ...1028
Aged Sow Transfer	Head	129, 229, ...1029

TABLE A-27

Linear Programming Matrix for a 2560 Acre Ranch in North Central South Dakota for Model I

Item	Unit	Row	B_1	P101	P102	P103	P104	P105
Native Pasture	Acre	R101	1500.0				1.0	
Crop Land	Acre	R102	620.0	1.0	1.0	1.0		1.0
Beef Cow Unit Transfer	Head	R103						
January - February Labor	Hour	R104	1000.0					
March - April Labor	Hour	R105	1000.0					
May - June Labor	Hour	R106	1000.0	.8	.46	1.1	1.02	.46
July - August Labor	Hour	R107	1000.0		1.47	.25	.24	1.22
September - October Labor	Hour	R108	1000.0	1.6	.25			.25
November - December Labor	Hour	R109	1000.0					
Corn Transfer	Bu.	R110		-25.0				
Oats Transfer	Bu.	R111			-30.0			
Barley Transfer	Bu.	R112						-25.0
Alfalfa Transfer	Ton	R113				-1.0		
Prairie Hay Transfer	Ton	R114					.75	
425 lb. Steer Transfer	Head	R115						
375 lb. Heifer Transfer	Head	R116						
Operating Capital	Dol.	R117	50000.0	28.36	21.08	12.33	11.73	20.90
Cash Flow	Dol.	R118		28.36	21.08	12.33	11.73	20.90
Total Fixed Expenses	Dol.	R119	29240.0					
Cash Flow Transfer	Dol.	R120		28.36	21.08	12.33	11.73	20.90
Livestock Investment Capital	Dol.	R121						
Aum's Grazing Transfer								
April 16 - May 15	Aum	R122						
May 16 - July 15	Aum	R123						
July 16 - August 31	Aum	R124						
September 1 - October 31	Aum	R125						
November 1 - April 15	Aum	R126						
Feeder Pig Transfer	Head	R127						
Tame Pasture	Acre	R128	300.0					
Aged Sow Transfer	Head	R129						
Beef Cow Unit Transfer	Head	R203						
Cash Flow	Dol.	R218		28.36	21.08	12.33	11.73	20.90
Return Over Variable Cost (Cj)	Dol.	R100		-28.36	-21.08	-12.33	-11.73	-20.90

TABLE A-27 (continued)

Row	P106	P107	P108	P109	P110	P111	P112	P113	P114	P115
R101										
R102	1.0	1.0								
R103										
R104			1.27	1.0	1.4	1.0	2.0		.32	
R105			2.37	.5		.8	8.0	1.0	1.4	
R106	.46	.46	.95			.6	2.0	2.0	.32	
R107	1.22	1.22	.23			.6	2.0	2.0	.32	
R108	.25	.25	.52	.5	.7	1.0	9.0	1.0	.32	
R109			1.27	1.0	1.4	1.0	2.0		.32	
R110			2.0		8.0		40.0	100.0	5.0	1.0
R111			4.0		14.0		30.0			
R112				8.0		8.0				
R113			.4	.23	.35	.23	.3		.23	
R114			1.4	.52		.52			.2	
R115			-.46	1.0		1.0				
R116			-.28		1.0					
R117	20.97	19.23	9.84	4.05	9.55	7.82	113.19	65.45	6.58	
R118	-4.08	-5.52	-17.37	-155.52	-148.52	-205.61	113.19	-477.09	-26.33	-1.18
R119										
R120	-4.08	-5.52	-17.37	-155.52	-148.52	-205.61	113.19	-477.09	-26.33	-1.18
R121			268.31				41.91		15.86	
R122						.61	.25		.333	
R123			2.91			1.34		1.14	.667	
R124			2.18			1.11		.86		
R125			2.91			.79	.25			
R126										
R127							-16.0	10.0		
R128										
R129							-1.0			
R203			-1.0							
R218	-4.08	-5.52	-17.37	-155.52	-148.52	-205.61	113.19	-477.09	-26.33	-1.18
R100	4.08	5.52	17.37	155.52	148.52	205.61	-113.19	477.09	26.33	1.18

TABLE A-27 (continued)

Row	P116	P117	P118	P119	P120	P121	P122	P125	P126	P127	P128
R101										1.0	
R102											
R103											
R104											
R105											
R106											
R107											
R108											
R109											
R110	-1.0										
R111		1.0	-1.0								
R112						1.0	-1.0				
R113				-1.0							
R114					-1.0						
R115											
R116											
R117								1.0			
R118	1.23	-.66	.71	27.0	22.0	-.96	1.01	1.0	-1.0	.75	1.62
R119								1.0			
R120	1.23	-.66	.71	27.0	22.0	-.96	1.01	1.0		.75	1.62
R121											
R122										-.266	-.392
R123										-.205	-.362
R124										-.266	-.246
R125										-.013	
R126											
R127											1.0
R128											
R129											
R203											
R218	1.23	-.66	.71	27.0	22.0	-.96	1.01	1.0		.75	1.62
R100	-1.23	.66	-.71	-27.0	-22.0	.96	-1.01	-1.0	-.0683	-.75	-1.62

TABLE A-27 (continued)

Row	P129	P131	P132	P133	P134
R101					
R102					
R103					
R104					
R105					
R106					
R107					
R108					
R109					
R110					
R111					
R112					
R113					
R114					
R115			1.0		
R116		1.0			
R117					
R118	5.55	-105.0	-136.0	-18.36	-92.16
R119					
R120	5.55	-105.0	-136.0	-18.36	-92.18
R121					
R122	-.155				
R123	-.393				
R124	-.303				
R125	-.399				
R126					
R127				1.0	
R128	1.0				
R129					1.0
R203					
R218	5.55	-105.0	-136.0	-18.36	-92.18
R100	-5.55	105.0	136.0	18.36	92.18

TABLE A-27 (continued)

Row	B_o	P201	P202	P203	P204	P205	P206	P207	P208	P209
R201	1500.0				1.0					
R202	620.0	1.0	1.0	1.0		1.0	1.0	1.0		
R203									1.0	
R204	1000.0								1.27	1.0
R205	1000.0								2.37	.5
R206	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95	
R207	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23	
R208	1000.0	1.6	.25			.25	.25	.25	.52	.5
R209	1000.0								1.27	1.0
R210		-15.0							2.0	
R211			-20.0						4.0	
R212						-15.0				8.0
R213				-.5					.4	.23
R214					-.5				1.4	.52
R215									-.46	1.0
R216									-.28	
R217		20.65	21.08	12.45	11.85	15.11	21.18	19.42	9.94	4.09
R218		20.65	21.08	12.45	11.85	15.11	7.18	5.02	-17.35	-162.87
R219	29897.6									
R220		20.65	21.08	12.45	11.85	15.11	7.18	5.02	-17.35	-162.87
R221									267.14	
R222										
R223									2.91	
R224									2.18	
R225									2.91	
R226										
R227										
R228	300.0									
R229										
R303									-1.0	
R318		20.65	21.08	12.45	11.85	15.11	7.18	5.02	-17.35	-162.87
R100		-20.65	-21.08	-12.45	-11.85	-15.11	-7.18	-5.02	17.35	162.87

TABLE A-27 (continued)

Row	P210	P211	P212	P213	P214	P215	P216	P218	P219	P220	P221
R201											
R202											
R203											
R204	1.4	1.0	2.0		.32						
R205		.8	8.0	1.0	1.4						
R206		.6	2.0	2.0	.32						
R207		.6	2.0	2.0	.32						
R208	.7	1.0	9.0	1.0	.32						
R209	1.4	1.0	2.0		.32						
R210	8.0		40.0	100.0	5.0	1.0	-1.0				
R211	14.0		30.0					-1.0			
R212		8.0									1.0
R213	.35	.23	.3		.23				-1.0		
R214		.52			.2					-1.0	
R215		1.0									
R216	1.0										
R217	9.65	7.90	106.74	66.11	6.65						
R218	-133.67	-203.48	106.74	-370.71	-31.04	-1.04	1.09	.33	26.0	21.0	-.94
R219											
R220	-133.67	-203.48	106.74	-370.71	-31.04	-1.04	1.09	.33	26.0	21.0	-.94
R221			34.74		15.56						
R222		.61	.25		.333						
R223		1.34		1.14	.667						
R224		1.11		.86							
R225		.79	.25								
R226											
R227			-16.0	10.0							
R228											
R229			-1.0								
R303											
R318	-133.67	-203.48	106.74	-370.71	-31.04	-1.04	1.09	.33	26.0	21.0	-.94
R100	133.67	203.48	-106.74	370.71	31.04	1.04	-1.09	-.33	-26.0	-21.0	.94

TABLE A-27 (continued)

Row	P222	P223	P224	P225	P226	P227	P228	P229	P231	P232
R201						1.0				
R202										
R203		1.0	-1.0							
R204										
R205										
R206										
R207										
R208										
R209										
R210										
R211										
R212	-1.0									
R213										
R214										1.0
R215									1.0	
R216										
R217				1.0						
R218	.99	-262.14	267.14	1.0	-1.0	.75	1.62	5.55	-103.13	-132.81
R219				1.0						
R220	.99	-262.14	267.14	1.0		.75	1.62	5.55	-103.13	-132.81
R221										
R222								-.093		
R223						-.177	-.3	-.236		
R224						-.137	-.271	-.181		
R225						-.186	-.179	-.24		
R226										
R227										
R228							1.0	1.0		
R229										
R303										
R318	.99	-262.14	267.14	1.0		.75	1.62	5.55	-103.13	-132.81
R100	-.99			-1.0	-.0709	-.75	-1.62	-5.55	103.13	132.81

TABLE A-27 (continued)

Row	P233	P234
R201		
R202		
R203		
R204		
R205		
R206		
R207		
R208		
R209		
R210		
R211		
R212		
R213		
R214		
R215		
R216		
R217		
R218	-14.78	-73.7
R219		
R220	-14.78	-73.7
R221		
R222		
R223		
R224		
R225		
R226		
R227	1.0	
R228		
R229		1.0
R303		
R318	-14.78	-73.7
R100	14.78	73.7

TABLE A-27 (continued)

Row	B_3	P301	P302	P303	P304	P305	P306	P307	P308
R301	1500.0				1.0				
R302	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R303									1.0
R304	1000.0								1.27
R305	1000.0								2.37
R306	1000.0	.4	.46			.46	.46	.46	.95
R307	1000.0								.23
R308	1000.0								.52
R309	1000.0								1.27
R310									2.0
R311									4.0
R312									
R313									.4
R314									1.4
R315									-.46
R316									-.28
R317		10.65	15.03	5.79	5.17	5.22	15.79	20.0	10.23
R318		10.65	15.03	5.79	5.17	5.22	6.79	13.97	-17.81
R319	30587.89								
R320		10.65	15.03	5.79	5.17	5.22	6.79	13.97	-17.81
R321									282.43
R322									
R323									2.91
R324									2.18
R325									2.91
R326									
R327									
R328									
R329	300.0								
R403									-1.0
R418		10.65	15.03	5.79	5.17	5.22	6.79	13.97	-17.81
R100		-10.65	-15.03	-5.79	-5.17	-5.22	-6.79	-13.97	17.81

TABLE A-27 (continued)

Row	P309	P310	P311	P312	P313	P314	P315	P316	P318
R301									
R302									
R303									
R304	1.0	1.4	1.0	2.0		.32			
R305	.5		.8	8.0	1.0	1.4			
R306			.6	2.0	2.0	.32			
R307			.6	2.0	2.0	.32			
R308	.5	.7	1.0	9.0	1.0	.32			
R309	1.0	1.4	1.0	2.0		.32			
R310		8.0		40.0	100.0	5.0	1.0	-1.0	
R311		14.0		30.0					-1.0
R312	8.0		8.0						
R313	.23	.35	.23	.3		.23			
R314	.52		.52			.2			
R315	1.0		1.0						
R316		1.0							
R317	4.21	9.94	8.13	108.33	66.09	6.85			
R318	-150.93	-133.37	-211.45	108.33	-376.71	-31.14	-1.04	1.09	.3
R319									
R320	-150.93	-133.37	-211.45	108.33	-376.71	-31.14	-1.04	1.09	.3
R321				34.17		16.45			
R322			.61	.25		.333			
R323			1.34		1.14	.667			
R324			1.11		.86				
R325			.79	.25					
R326									
R327				-16.0	10.0				
R328									
R329				-1.0					
R403									
R418	-150.93	-133.37	-211.45	108.33	-376.71	-31.14	-1.04	1.09	.3
R100	150.93	133.37	211.45	-108.33	376.71	31.14	1.04	-1.09	-.3

TABLE A-27 (continued)

Row	P319	P320	P321	P322	P323	P324	P325	P326
R301								
R302								
R303					1.0	-1.0		
R304								
R305								
R306								
R307								
R308								
R309								
R310								
R311								
R312			1.0	-1.0				
R313	-1.0							
R314		-1.0						
R315								
R316								
R317							1.0	
R318	27.0	22.0	-.85	.9	-277.43	282.43	1.0	-1.0
R319							1.0	
R320	27.0	22.0	-.85	.9	-277.43	282.43	1.0	
R321								
R322								
R323								
R324								
R325								
R326								
R327								
R328								
R329								
R403								
R418	27.0	22.0	-.85	.9	-277.43	282.43	1.0	
R100	-27.0	-22.0	.85	-.9			-1.0	-.0733

TABLE A-27 (continued)

Row	P327	P328	P329	P330	P331	P332	P333	P334
R301	1.0							
R302								
R303								
R304								
R305								
R306								
R307								
R308								
R309								
R310								
R311								
R312								
R313								
R314								
R315						1.0		
R316					1.0			
R317								
R318	.75	1.62	5.55	8.5	-105.0	-136.0	-15.05	-73.96
R319								
R320	.75	1.62	5.55	8.5	-105.0	-136.0	-15.05	-73.96
R321								
R322			-.093					
R323				-.383				
R324				-.31				
R325				-.307				
R326								
R327							1.0	
R328		1.0	1.0					
R329								1.0
R403								
R418	.75	1.62	5.55	8.5	-105.0	-136.0	-15.05	-73.96
R100	-.75	-1.62	-5.55	-8.5	105.0	136.0	15.05	73.96

TABLE A-27 (continued)

Row	B_i	P_{401}	P_{402}	P_{403}	P_{404}	P_{405}	P_{406}	P_{407}	P_{408}
R401	1500.0				1.0				
R402	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R403									1.0
R404	1000.0								1.27
R405	1000.0								2.37
R406	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95
R407	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23
R408	1000.0	1.6	.25			.25	.25	.25	.52
R409	1000.0								1.27
R410		-39.0							2.0
R411			-44.0						4.0
R412						-28.0			
R413				-1.8					.4
R414					-.9				1.4
R415									-.46
R416									-.28
R417		31.8	23.63	13.82	13.15	23.44	23.51	21.56	11.03
R418		31.8	23.63	13.82	13.15	23.44	-.56	-.06	-18.16
R419	31312.62								
R420		31.8	23.63	13.82	13.15	23.44	-.56	-.06	-18.16
R421									311.86
R422									
R423									2.91
R424									2.18
R425									2.91
R426									
R427									
R428									
R429	300.0								
R503									-1.0
R518		31.8	23.63	13.82	13.15	23.44	-.56	-.06	-18.16
R100		-31.8	-23.63	-13.82	-13.15	-23.44	.56	.06	18.16

TABLE A-27 (continued)

Row	P4.09	P4.10	P4.11	P4.12	P4.13	P4.14	P4.15	P4.16	P4.17
R401									
R402									
R403									
R404	1.0	1.4	1.0	2.0		.32			
R405	.5		.8	8.0	1.0	1.4			
R406			.6	2.0	2.0	.32			
R407			.6	2.0	2.0	.32			
R408	.5	.7	1.0	9.0	1.0	.32			
R409	1.0	1.4	1.0	2.0		.32			
R410		8.0		40.0	100.0	5.0	1.0	-1.0	
R411		14.0		30.0					-1.0
R412	8.0		8.0						
R413	.23	.35	.23	.3		.23			
R414	.52		.52			.2			
R415	1.0		1.0						
R416		1.0							
R417	4.54	10.71	8.76	121.27	73.38	7.38			
R418	-180.15	-141.47	-237.5	121.27	-510.6	-34.92	-1.03	1.08	-.55
R419									
R420	-180.15	-141.47	-237.5	121.27	-510.6	-34.92	-1.03	1.08	-.55
R421				41.35		19.67			
R422			.61	.25		.333			
R423			1.34		1.14	.667			
R424			1.11		.86				
R425			.79	.25					
R426									
R427				-16.0	10.0				
R428									
R429				-1.0					
R503									
R518	-180.15	-141.47	-237.5	121.27	-510.6	-34.92	-1.03	1.08	-.55
R100	180.15	141.47	237.5	-121.27	510.6	34.92	1.03	-1.08	.55

TABLE A-27 (continued)

Row	P4.18	P4.19	P4.20	P4.21	P4.22	P4.23	P4.24	P4.25	P4.26
R4.01									
R4.02									
R4.03						1.0	-1.0		
R4.04									
R4.05									
R4.06									
R4.07									
R4.08									
R4.09									
R4.10									
R4.11	-1.0								
R4.12				1.0	-1.0				
R4.13		-1.0							
R4.14			-1.0						
R4.15									
R4.16									
R4.17								1.0	
R4.18	.6	26.5	21.5	-.79	.84	-306.84	311.84	1.0	-1.0
R4.19								1.0	
R4.20	.6	26.5	21.5	-.79	.84	-306.84	311.84	1.0	
R4.21									
R4.22									
R4.23									
R4.24									
R4.25									
R4.26									
R4.27									
R4.28									
R4.29									
R503									
R518	.6	26.5	21.5	-.79	.84	-306.84	311.84	1.0	
R100	-.6	-26.5	-21.5	.79	-.84			-1.0	-.078

TABLE A-27 (continued)

Row	P427	P428	P429	P431	P432	P433	P434
R401	1.0						
R402							
R403							
R404							
R405							
R406							
R407							
R408							
R409							
R410							
R411							
R412							
R413							
R414							
R415					1.0		
R416				1.0			
R417							
R418	.75	1.62	5.55	-120.0	-150.88	-19.75	-105.16
R419							
R420	.75	1.62	5.55	-120.0	-150.88	-19.75	-105.16
R421							
R422			-.199				
R423	-.305	-.433	-.506				
R424	-.239	-.392	-.389				
R425	-.31	-.175	-.506				
R426	-.035		-.1				
R427						1.0	
R428		1.0	1.0				
R429							1.0
R503							
R518	.75	1.62	5.55	-120.0	-150.88	-19.75	-105.16
R100	-.75	-1.62	-5.55	120.0	150.88	19.75	105.16

TABLE A-27 (continued)

Row	B_5	P501	P502	P503	P504	P505	P506	P507	P508
R501	1500.0				1.0				
R502	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R503									1.0
R504	1000.0								1.27
R505	1000.0								2.37
R506	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95
R507	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23
R508	1000.0	1.6	.25			.25	.25	.25	.52
R509	1000.0								1.27
R510		-34.0							2.0
R511			-43.5						4.0
R512						-31.0			
R513				-1.75					.4
R514					-.9				1.4
R515									-.46
R516									-.28
R517		32.94	24.48	14.32	13.62	24.28	24.36	22.33	11.43
R518		32.94	24.48	14.32	13.62	24.28	-4.15	-10.79	-22.61
R519	32073.66								
R520		32.94	24.48	14.32	13.62	24.28	-4.15	-10.79	-22.61
R521									320.08
R522									
R523									2.91
R524									2.18
R525									2.91
R526									
R527									
R528	300.0								
R529									
R603									-1.0
R618		32.94	24.48	14.32	13.62	24.28	-4.15	-10.79	-22.61
R100		-32.94	-24.48	-14.32	-13.62	-24.28	4.15	10.79	22.61

TABLE A-27 (continued)

Row	P509	P510	P511	P512	P513	P514	P515	P516	P517
R501									
R502									
R503									
R504	1.0	1.4	1.0	2.0		.32			
R505	.5		.8	8.0	1.0	1.4			
R506			.6	2.0	2.0	.32			
R507			.6	2.0	2.0	.32			
R508	.5	.7	1.0	9.0	1.0	.32			
R509	1.0	1.4	1.0	2.0		.32			
R510		8.0		40.0	100.0	5.0	1.0	-1.0	
R511		14.0		30.0					1.0
R512	8.0		8.0						
R513	.23	.35	.23	.3		.23			
R514	.52		.52			.2			
R515	1.0		1.0						
R516		1.0							
R517	4.70	11.09	9.08	124.15	76.02	7.64			
R518	-202.15	-169.17	-245.39	124.15	-389.39	-33.8	-1.21	1.26	-.57
R519									
R520	-202.15	-169.17	-245.39	124.15	-389.39	-33.8	-1.21	1.26	-.57
R521				41.35		18.5			
R522			.61	.25		.333			
R523			1.34		1.14	.667			
R524			1.11		.86				
R525			.79	.25					
R526									
R527				-16.0	10.0				
R528									
R529				-1.0					
R603									
R618	-202.15	-169.17	-245.39	124.15	-389.39	-33.8	-1.21	1.26	-.57
R100	202.15	169.17	245.39	-124.15	389.39	33.8	1.21	-1.26	.57

TABLE A-27 (continued)

Row	P518	P519	P520	P521	P522	P523	P524	P525
R501								
R502						1.0	-1.0	
R503								
R504								
R505								
R506								
R507								
R508								
R509								
R510								
R511	-1.0							
R512				1.0	-1.0			
R513		-1.0						
R514			-1.0					
R515								
R516								
R517								1.0
R518	.62	25.5	20.5	-.84	.89	-315.08	320.08	1.0
R519								1.0
R520	.62	25.5	20.5	-.84	.89	-315.08	320.08	1.0
R521								
R522								
R523								
R524								
R525								
R526								
R527								
R528								
R529								
R603								
R618	.62	25.5	20.5	-.84	.89	-315.08	320.08	1.0
R100	-.62	-25.5	-20.5	.84	-.89			-1.0

TABLE A-27 (continued)

Row	P526	P527	P528	P529	P531	P532	P533	P534
R501		1.0						
R502								
R503								
R504								
R505								
R506								
R507								
R508								
R509								
R510								
R511								
R512								
R513								
R514			-.5					
R515						1.0		
R516					1.0			
R517								
R518	-1.0	.75	6.31	5.55	-129.38	-164.69	-15.88	-73.13
R519								
R520		.75	6.31	5.55	-129.38	-164.69	-15.88	-73.13
R521								
R522				-.222				
R523		-.287	-.665	-.565				
R524		-.225	-.601	-.435				
R525		-.292	-.524	-.528				
R526		-.076						
R527							1.0	
R528			1.0	1.0				
R529								1.0
R603								
R613		.75	6.31	5.55	-129.38	-164.69	-15.88	-73.13
R100	-.0838	-.75	-6.31	-5.55	129.38	164.69	15.88	73.13

TABLE A-27 (continued)

Row	B_6	P601	P602	P603	P604	P605	P606	P607	P608
R601	1500.0				1.0				
R602	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R603									1.0
R604	1000.0								1.27
R605	1000.0								2.37
R606	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95
R607	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23
R608	1000.0	1.6	.25			.25	.25	.25	.52
R609	1000.0								1.27
R610		-25.0							2.0
R611			-60.0						4.0
R612						-44.5			
R613				-1.3					.4
R614					-.8				1.4
R615									-.46
R616									-.28
R617		34.09	25.33	14.82	14.1	25.12	25.21	23.11	11.82
R618		34.09	25.33	14.82	14.1	25.12	-13.17	-8.48	-21.96
R619	32872.97								
R620		34.09	25.33	14.82	14.1	25.12	-13.17	-8.48	-21.96
R621									340.8
R622									
R623									2.91
R624									2.18
R625									2.91
R626									
R627									
R628	300.0								
R629									
R703									
R718		34.09	25.33	14.82	14.1	25.12	-13.17	-8.48	-21.96
R100		-34.09	-25.33	-14.82	-14.1	-25.12	13.17	8.48	21.96

TABLE A-27 (continued)

Row	P609	P610	P611	P612	P613	P614	P615	P616	P617
R601									
R602									
R603									
R604	1.0	1.4	1.0	2.0		.32			
R605	.5		.8	8.0	1.0	1.4			
R606			.6	2.0	2.0	.32			
R607			.6	2.0	2.0	.32			
R608	.5	.7	1.0	9.0	1.0	.32			
R609	1.0	1.4	1.0	2.0		.32			
R610		8.0		40.0	100.0	5.0	1.0	-1.0	
R611		14.0		30.0					1.0
R612	8.0		8.0						
R613	.23	.35	.23	.3		.23			
R614	.52		.52			.2			
R615	1.0		1.0						
R616		1.0							
R617	4.87	11.48	9.4	118.53	78.67	7.91			
R618	-196.07	-174.69	-263.54	118.53	-325.57	-34.04	-1.05	1.1	-.54
R619									
R620	-196.07	-174.69	-263.54	118.53	-325.57	-34.04	-1.05	1.1	-.54
R621				32.85		15.86			
R622			.61	.25		.333			
R623			1.34		1.14	.667			
R624			1.11		.86				
R625			.79	.25					
R626									
R627				-16.0	10.0				
R628									
R629				-1.0					
R703									
R718	-196.07	-174.69	-263.54	118.53	-325.57	-34.04	-1.05	1.1	-.54
R100	196.07	174.69	263.54	-118.53	325.57	34.04	1.05	-1.1	.54

TABLE A-27 (continued)

Row	P618	P619	P620	P621	P622	P623	P624	P625
R601								
R602								
R603						1.0	-1.0	
R604								
R605								
R606								
R607								
R608								
R609								
R610								
R611	-1.0							
R612				1.0	-1.0			
R613		-1.0						
R614			-1.0					
R615								
R616								1.0
R617								1.0
R618	.59	25.5	20.5	-.8	.85	-339.8	344.8	1.0
R619								1.0
R620	.59	25.5	20.5	-.8	.85	-339.8	344.8	1.0
R621								
R622								
R623								
R624								
R625								
R626								
R627								
R628								
R629								
R703								
R718	.59	25.5	20.5	-.8	.85	-339.8	344.8	1.0
R100	-.59	-25.5	-20.5	.8	-.85			-1.0

TABLE A-27 (continued)

Row	P626	P627	P628	P629	P631	P632	P633	P634
R601		1.0						
R602								
R603								
R604								
R605								
R606								
R607								
R608								
R609								
R610								
R611								
R612								
R613								
R614								
R615						1.0		
R616					1.0			
R617								
R618	-1.0	.75	1.62	5.55	-131.25	-167.88	-13.68	-67.1
R619								
R620		.75	1.62	5.55	-131.25	-167.88	-13.68	-67.1
R621								
R622				-.245				
R623		-.394	-.533	-.623				
R624		-.309	-.482	-.48				
R625		-.401	-.195	-.592				
R626		-.086						
R627							1.0	
R628			1.0	1.0				
R629								1.0
R703								
R718		.75	1.62	5.55	-131.25	-167.88	-13.68	-67.1
R100	-.0773	-.75	-1.62	-5.55	131.25	167.88	13.68	67.1

TABLE A-27 (continued)

Row	B_7	P701	P702	P703	P704	P705	P706	P707	P708
R701	1500.0				1.0				
R702	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R703									1.0
R704	1000.0								1.27
R705	1000.0								2.37
R706	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95
R707	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23
R708	1000.0	1.6	.25			.25	.25	.25	.52
R709	1000.0								1.27
R710		-51.0							2.0
R711			-50.0						4.0
R712						-37.0			
R713				-1.6					.4
R714					-.9				1.4
R715									-.46
R716									-.28
R717		36.10	26.82	15.69	14.93	26.6	26.69	24.47	12.52
R718		36.10	26.82	15.69	14.93	26.6	-12.04	-5.41	-28.81
R719	33712.61								
R720		36.10	26.82	15.69	14.93	26.6	-12.04	-5.41	-28.81
R721									397.76
R722									
R723									2.91
R724									2.18
R725									2.91
R726									
R727									
R728	300.0								
R729									
R803									-1.0
R818		36.10	26.82	15.69	14.93	26.6	-12.04	-5.41	-28.81
R100		-36.10	-26.82	-15.69	-14.93	-26.6	12.04	5.41	28.81

TABLE A-27 (continued)

Row	P709	P710	P711	P712	P713	P714	P715	P716	P717
R701									
R702									
R703									
R704	1.0	1.4	1.0	2.0		.32			
R705	.5		.8	8.0	1.0	1.4			
R706			.6	2.0	2.0	.32			
R707			.6	2.0	2.0	.32			
R708	.5	.7	1.0	9.0	1.0	.32			
R709	1.0	1.4	1.0	2.0		.32			
R710		8.0		40.0	100.0	5.0	1.0	-1.0	
R711		14.0		30.0					1.0
R712	8.0		8.0						
R713	.23	.35	.23	.3		.23			
R714	.52		.52			.2			
R715	1.0		1.0						
R716		1.0							
R717	5.15	12.16	9.94	137.17	83.3	8.38			
R718	-226.82	-194.69	-334.82	137.17	-566.5	-36.84	-1.37	1.42	-.66
R719									
R720	-226.82	-194.69	-334.82	137.17	-566.5	-36.84	-1.37	1.42	-.66
R721				46.45		16.45			
R722			.61	.25		.333			
R723			1.34		1.14	.667			
R724			1.11		.86				
R725			.79	.25					
R726									
R727				-16.0	10.0				
R728									
R729				-1.0					
R803									
R818	-226.82	-194.69	-334.82	137.17	-566.5	-36.84	-1.37	1.42	-.66
R100	226.82	194.69	334.82	-137.17	566.5	36.84	1.37	-1.42	.66

TABLE A-27 (continued)

Row	P718	P719	P720	P721	P722	P723	P724	P725	P726
R701									
R702									
R703						1.0	-1.0		
R704									
R705									
R706									
R707									
R708									
R709									
R710									
R711	-1.0								
R712				1.0	-1.0				
R713		-1.0							
R714			-1.0						
R715									
R716									
R717								1.0	
R718	.71	25.5	20.5	-.96	1.01	-392.76	397.76	1.0	-1.0
R719								1.0	
R720	.71	25.5	20.5	-.96	1.01	-392.76	397.76	1.0	
R721									
R722									
R723									
R724									
R725									
R726									
R727									
R728									
R729									
R803									
R818	.71	25.5	20.5	-.96	1.01	-392.76	397.76	1.0	
R100	-.71	-25.5	-20.5	.96	-1.01			-1.0	-.0757

TABLE A-27 (continued)

Row	P727	P728	P729	P731	P732	P733	P734
R701	1.0						
R702							
R703							
R704							
R705							
R706							
R707							
R708							
R709							
R710							
R711							
R712							
R713							
R714							
R715					1.0		
R716				1.0			
R717							
R718	.75	1.62	5.55	-164.06	-212.5	-26.62	-112.64
R719							
R720	.75	1.62	5.55	-164.06	-212.5	-26.62	-112.64
R721							
R722			-.246				
R723	-.339	-.548	-.626				
R724	-.265	-.496	-.482				
R725	-.346	-.316	-.626				
R726			-.01				
R727						1.0	
R728		1.0	1.0				
R729							1.0
R803							
R618	.75	1.62	5.55	-164.06	-212.5	-26.62	-112.64
R100	-.75	-1.62	-5.55	164.06	212.5	26.62	112.64

TABLE A-27 (continued)

Row	B_0	P801	P802	P803	P804	P805	P806	P807	P808
R801	1500.0				1.0				
R802	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R803									1.0
R804	1000.0								1.27
R805	1000.0								2.37
R806	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95
R807	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23
R808	1000.0	1.6	.25			.25	.25	.25	.52
R809	1000.0								1.27
R810		-31.0							2.0
R811			-34.0						4.0
R812						-30.0			
R813				-.9					.4
R814					-.7				1.4
R815									-.46
R816									-.28
R817		41.82	31.08	18.18	17.3	30.83	30.92	28.35	14.51
R818		41.82	31.08	18.18	17.3	30.83	-46.25	-40.95	-38.14
R819	34594.79								
R820		41.82	31.08	18.18	17.3	30.83	-46.25	-40.95	-38.14
R821									507.2
R822									
R823									2.91
R824									2.18
R825									2.91
R826									
R827									
R828	300.0								
R829									
R903									-1.0
R918		41.82	31.08	18.18	17.3	30.83	-46.25	-40.95	-38.14
R100		-41.82	-31.08	-18.18	-17.3	-30.83	46.25	40.95	38.14

TABLE A-27 (continued)

Row	P809	P810	P811	P812	P813	P814	P815	P816	P817
R801									
R802									
R803									
R804	1.0	1.4	1.0	2.0		.32			
R805	.5		.8	8.0	1.0	1.4			
R806			.6	2.0	2.0	.32			
R807			.6	2.0	2.0	.32			
R808	.5	.7	1.0	9.0	1.0	.32			
R809	1.0	1.4	1.0	2.0		.32			
R810		8.0		40.0	100.0	5.0	1.0	-1.0	
R811		14.0		30.0					1.0
R812	8.0		8.0						
R813	.23	.35	.23	.3		.23			
R814	.52		.52			.2			
R815	1.0		1.0						
R816		1.0							
R817	5.97	14.08	11.53	176.68	96.52	9.7			
R818	-323.81	-257.78	-409.58	176.68	-1029.78	-42.0	-2.37	2.42	-1.11
R819									
R820	-323.81	-257.78	-409.58	176.68	-1029.78	-42.0	-2.37	2.42	-1.11
R821				71.56		31.12			
R822			.61	.25		.333			
R823			1.34		1.14	.667			
R824			1.11		.86				
R825			.79	.25					
R826									
R827				-16.0	10.0				
R828									
R829				-1.0					
R903									
R918	-323.81	-257.78	-409.58	176.68	-1029.78	-42.0	-2.37	2.42	-1.11
R100	323.81	257.78	409.58	-176.68	1029.78	42.0	2.37	-2.42	1.11

TABLE A-27 (continued)

Row	P818	P819	P820	P821	P822	P823	P824	P825
R801								
R802								
R803						1.0	-1.0	
R804								
R805								
R806								
R807								
R808								
R809								
R810								
R811	-1.0							
R812				1.0	-1.0			
R813		-1.0						
R814			-1.0					
R815								
R816								
R817								1.0
R818	1.16	40.5	35.5	-1.85	1.9	-502.2	507.2	1.0
R819								1.0
R820	1.16	40.5	35.5	-1.85	1.9	-502.2	507.2	1.0
R821								
R822								
R823								
R824								
R825								
R826								
R827								
R828								
R829								
R903								
R918	1.16	40.5	35.5	-1.85	1.9	-502.2	507.2	1.0
R100	-1.16	-40.5	-35.5	1.85	-1.9			-1.0

TABLE A-27 (continued)

Row	P826	P827	P828	P829	P831	P832	P833	P834
R801		1.0						
R802								
R803								
R804								
R805								
R806								
R807								
R808								
R809								
R810								
R811								
R812								
R813								
R814			-.5					
R815						1.0		
R816					1.0			
R817								
R818	-1.0	.75	6.31	5.55	-256.88	-275.83	-37.1	-206.14
R819								
R820		.75	6.31	5.55	-256.88	-275.83	-37.1	-206.14
R821								
R822				-.173				
R823		-.383	-.552	-.44				
R824		-.3	-.499	-.339				
R825		-.307	-.319	-.318				
R826								
R827							1.0	
R828			1.0	1.0				
R829								1.0
R903								
R918		.75	6.31	5.55	-256.88	-275.83	-37.1	-206.14
R100	-.083	-.75	-6.31	-5.55	256.88	275.83	37.1	206.14

TABLE A-27 (continued)

Row	B_0	P901	P902	P903	P904	P905	P906	P907	P908
R901	1500.0				1.0				
R902	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R903									1.0
R904	1000.0								1.27
R905	1000.0								2.37
R906	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95
R907	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23
R908	1000.0	1.6	.25			.25	.25	.25	.52
R909	1000.0								1.27
R910		-17.0							2.0
R911			-24.0						4.0
R912						-14.0			
R913				-1.2					.4
R914					-.7				1.4
R915									-.46
R916									-.28
R917		50.71	37.68	22.04	20.97	37.37	37.49	34.37	17.59
R918		50.71	37.68	22.04	20.97	37.37	-27.91	-10.27	-11.59
R919	35521.82								
R920		50.71	37.68	22.04	20.97	37.37	-27.91	-10.27	-11.59
R921									434.24
R922									
R923									2.91
R924									2.18
R925									2.91
R926									
R927									
R928	300.0								
R929									
R1003									-1.0
R1018		50.71	37.68	22.04	20.97	37.37	-27.91	-10.27	-11.59
R100		-50.71	-37.68	-22.04	-20.97	-37.37	27.91	10.27	11.59

TABLE A-27 (continued)

Row	P909	P910	P911	P912	P913	P914	P915	P916	P917
R901									
R902									
R903									
R904	1.0	1.4	1.0	2.0					
R905	.5		.8	8.0	1.0	.32			
R906			.6	2.0	2.0	1.4			
R907			.6	2.0	2.0	.32			
R908	.5	.7	1.0	9.0	1.0	.32			
R909	1.0	1.4	1.0	2.0		.32			
R910		8.0		40.0	100.0	.32	1.0	-1.0	
R911		14.0		30.0		5.0			1.0
R912	8.0		8.0						
R913	.23	.35	.23	.3		.23			
R914	.52		.52			.2			
R915	1.0		1.0						
R916		1.0							
R917	7.24	17.08	13.98	190.88	117.01	11.77			
R918	-266.39	-221.09	-232.28	190.88	-727.38	-44.05	-3.05	3.1	-1.48
R919									
R920	-266.39	-221.09	-232.28	190.88	-727.38	-44.05	-3.05	3.1	-1.48
R921				63.44		27.02			
R922			.61	.25		.333			
R923			1.34		1.14	.667			
R924			1.11		.86				
R925			.79	.25					
R926									
R927				-16.0	10.0				
R928									
R929				-1.0					
R1003									
R1018	-266.39	-221.09	-232.28	190.88	-727.38	-44.05	-3.05	3.1	-1.48
R100	266.39	221.09	232.28	-190.88	727.38	44.05	3.05	-3.1	1.48

TABLE A-27 (continued)

Row	P918	P919	P920	P921	P922	P923	P924	P925
R901								
R902								
R903						1.0	-1.0	
R904								
R905								
R906								
R907								
R908								
R909								
R910								
R911	-1.0							
R912				1.0	-1.0			
R913		1.0						
R914			-1.0					
R915								
R916								1.0
R917								1.0
R918	1.53	54.5	49.5	-2.56	2.61	-429.24	434.24	1.0
R919								1.0
R920	1.53	54.5	49.5	-2.56	2.61	-429.24	434.24	1.0
R921								
R922								
R923								
R924								
R925								
R926								
R927								
R928								
R929								
R1003								
R1018	1.53	54.5	49.5	-2.56	2.61	-429.24	434.24	1.0
R100	-1.53	-54.5	-49.5	2.56	-2.61			-1.0

TABLE A-27 (continued)

Row	P926	P927	P928	P929	P931	P932	P933	P934
R901		1.0						
R902								
R903								
R904								
R905								
R906								
R907								
R908								
R909								
R910								
R911								
R912								
R913								
R914								
R915						1.0		
R916					1.0			
R917								
R918	-1.0	.75	1.62	5.55	-106.88	-131.75	-28.18	-137.72
R919								
R920		.75	1.62	5.55	-106.88	-131.75	-28.18	-137.72
R921								
R922				-.21				
R923		-.391	-.843	-.535				
R924		-.307	-.4	-.412				
R925		-.222	-.367	-.333				
R926								
R927							1.0	
R928			1.0	1.0				
R929								1.0
R1003								
R1018		.75	1.62	5.55	-106.88	-131.75	-28.18	-137.72
R100	-.0926	-.75	-1.62	-5.55	106.88	131.75	28.18	137.72

TABLE A-27 (continued)

Row	B_{10}	P1001	P1002	P1003	P1004	P1005	P1006	P1007	P1008
R1001	1500.0				1.0				
R1002	620.0	1.0	1.0	1.0		1.0	1.0	1.0	
R1003									1.0
R1004	1000.0								1.27
R1005	1000.0								2.37
R1006	1000.0	.8	.46	1.1	1.02	.46	.46	.46	.95
R1007	1000.0		1.47	.25	.24	1.22	1.22	1.22	.23
R1008	1000.0	1.6	.25			.25	.25	.25	.52
R1009	1000.0								1.27
R1010		-25.0							2.0
R1011			-41.0						4.0
R1012						-30.0			
R1013				-1.6					.4
R1014					-.8				1.4
R1015									-.46
R1016									-.28
R1017		63.31	47.05	27.52	26.18	46.66	46.81	42.92	21.96
R1018		63.31	47.05	27.52	26.18	46.66	-28.83	-18.18	-9.99
R1019	36496.14								
R1020		63.31	47.05	27.52	26.18	46.66	-28.83	-18.18	-9.99
R1021									408.35
R1022									
R1023									2.91
R1024									2.18
R1025									2.91
R1026									
R1027									
R1028									
R1029	300.0								
R100		-63.31	-47.05	-27.52	-26.18	-46.66	28.83	18.18	9.99

TABLE A-27 (continued)

Row	P1009	P1010	P1011	P1012	P1013	P1014	P1015	P1016	P1017
R1001									
R1002									
R1003									
R1004	1.0	1.4	1.0	2.0		.32			
R1005	.5		.8	8.0	1.0	1.4			
R1006			.6	2.0	2.0	.32			
R1007			.6	2.0	2.0	.32			
R1008	.5	.7	1.0	9.0	1.0	.32			
R1009	1.0	1.4	1.0	2.0		.32			
R1010		8.0		40.0	100.0	5.0	1.0	-1.0	
R1011		14.0		30.0					1.0
R1012	8.0		8.0						
R1013	.23	.35	.23	.3		.23			
R1014	.52		.52			.2			
R1015	1.0		1.0						
R1016		1.0							
R1017	9.04	21.32	17.45	246.91	146.1	14.69			
R1018	-166.78	-111.66	-306.8	246.91	-1153.95	-43.22	-2.45	2.5	-1.45
R1019									
R1020	-166.78	-111.66	-306.8	246.91	-1153.95	-43.22	-2.45	2.5	-1.45
R1021				87.79		25.55			
R1022			.61	.25		.333			
R1023			1.34		1.14	.667			
R1024			1.11		.86				
R1025			.79	.25					
R1026									
R1027				-16.0	10.0				
R1028									
R1029				-1.0					
R100	166.78	111.66	306.8	-246.91	1153.95	43.22	2.45	-2.5	1.45

TABLE A-27 (continued)

Row	P1018	P1019	P1020	P1021	P1022	P1024	P1025	P1026
R1001								
R1002								
R1003						-1.0		
R1004								
R1005								
R1006								
R1007								
R1008								
R1009								
R1010								
R1011	-1.0							
R1012				1.0	-1.0			
R1013		-1.0						
R1014			-1.0					
R1015								
R1016								
R1017							1.0	
R1018	1.5	51.5	46.5	-2.56	2.61	408.35	1.0	-1.0
R1019							1.0	
R1020	1.5	51.5	46.5	-2.56	2.61	408.35	1.0	
R1021								
R1022								
R1023								
R1024								
R1025								
R1026								
R1027								
R1028								
R1029								
R100	-1.5	-51.5	-46.5	2.56	-2.61		-1.0	-.088

TABLE A-27 (continued)

Row	P1027	P1028	P1029	P1031	P1032	P1033	P1034
R1001	1.0						
R1002							
R1003							
R1004							
R1005							
R1006							
R1007							
R1008							
R1009							
R1010							
R1011							
R1012							
R1013							
R1014							
R1015					1.0		
R1016				1.0			
R1017							
R1018	.75	1.62	5.55	-109.69	-144.5	-48.13	-230.16
R1019							
R1020	.75	1.62	5.55	-109.69	-144.5	-48.13	-230.16
R1021							
R1022			-.199				
R1023	-.328	-.532	-.506				
R1024	-.257	-.481	-.389				
R1025	-.333	-.297	-.506				
R1026	-.082		-.1				
R1027						1.0	
R1028		1.0	1.0				
R1029							1.0
R100	-.75	-1.62	-5.55	109.69	144.5	48.13	230.16

TABLE A-28

Components of Farm Income, 1924-1974

Year	Cash Receipts From Farm Marketing			
	Livestock	Crops	Total crops and livestock	Government Payments
	- - - - - - MILLIONS OF DOLLARS - - - - - - - - - - - -			
1924	127.2	96.8	224.0	
1925	164.5	77.5	242.1	
1926	161.5	36.3	197.8	
1927	130.5	75.2	205.7	
1928	163.9	78.2	242.1	
1929	170.3	65.3	235.5	
1930	148.5	45.0	193.5	
1931	121.3	13.1	134.4	
1932	47.9	12.4	60.3	
1933	61.1	14.8	75.9	.7
1934	62.3	6.7	69.0	14.3
1935	54.3	22.8	77.1	16.8
1936	94.2	16.9	111.1	9.4
1937	71.2	19.1	90.2	13.8
1938	71.0	20.0	91.0	16.4
1939	77.3	26.3	103.6	21.9
1940	87.0	33.0	120.0	19.8
1941	120.8	47.5	168.3	9.9
1942	175.4	73.1	248.5	16.9
1943	254.0	99.2	353.3	16.4
1944	249.5	107.2	356.7	13.4
1945	254.0	174.3	428.3	11.1
1946	311.2	177.1	488.3	15.1
1947	399.8	268.9	668.7	6.0
1948	383.1	255.1	638.2	4.4
1949	360.6	189.0	549.7	4.2
1950	352.7	154.9	507.6	5.4
1951	403.7	192.2	596.0	6.5
1952	404.6	163.4	567.9	3.0
1953	356.5	172.7	529.3	5.1
1954	365.8	201.9	567.7	5.7
1955	363.2	167.1	530.2	5.8
1956	364.6	125.8	490.4	22.4
1957	389.7	147.8	537.5	28.9
1958	479.1	203.9	683.0	25.0
1959	499.9	123.9	623.8	26.4
1960	453.1	143.6	596.6	28.9

TABLE A-28 (continued)

Year	Cash Receipts From Farm Marketing			
	Livestock	Crops	Total crops and livestock	Government Payments
	- - - - - - MILLIONS OF DOLLARS - - - - - - - - - - - -			
1961	480.9	168.5	649.5	44.2
1962	502.7	175.0	677.7	53.3
1963	493.0	171.8	664.8	60.1
1964	516.6	157.1	673.7	67.9
1965	600.4	158.0	758.3	78.1
1966	675.3	199.2	874.5	77.7
1967	696.9	203.6	900.5	65.9
1968	723.8	189.2	913.1	88.8
1969	770.2	193.9	964.1	94.4
1970	764.1	250.8	1,014.9	91.7
1971	824.8	229.1	1,054.0	77.8
1972	968.8	321.3	1,290.1	111.5
1973	1,233.8	665.1	1,898.8	71.4
1974	1,278.6	816.0	2,094.6	33.4

TABLE A-29

Expected Corn, Barley and Wheat Production Per Acre

Expected Production	Unit	Corn	Barley	Wheat
	Bushel	40	35	20

TABLE A-30

Loan Rates for Crops Used in Compiling Crop Disaster Payments During Drought Years of Models I and II*

Crops	Planning Year	Loan Rate
Corn	2	.96
Corn	3	.97
Corn	5	1.05
Corn	6	1.05
Barley	2	.91
Barley	3	.91
Barley	5	.83
Barley	6	.81
Wheat	2	1.34
Wheat	3	1.34
Wheat	5	1.25
Wheat	6	1.25

* Based on information provided by the Agricultural Stabilization and Conservation Service

APPENDIX B

A REVIEW OF GOVERNMENT ASSISTANCE TO SOUTH DAKOTA CATTLE PRODUCERS, 1933 - 1977

Government payments to South Dakota cattle producers began in 1933 primarily as a result of the Depression. In South Dakota total cash receipts from farm marketings dropped from $134.4 million in 1931 to $60.3 million in 1932.[1] In 1940 government farm payments for South Dakota agriculture exceeded 14% of total cash receipts from farm marketings including government payments.[2] Government assistance in the form of such non-payment aid as emergency credit and increased federal grazing land also provided substantial help. Table A-28 of Appendix A presents a yearly breakdown of South Dakota farm income from 1924 - 1974.

Since 1933 a series of interrelated laws and programs has established a system of government assistance to agriculture. Many of these programs, administered through the United States Department of Agriculture, have affected South Dakota cattle producers. In this Appendix the major federal legislation and programs which have furnished assistance to South Dakota cattle producers are reviewed. From this information assumptions concerning government assistance to cattle producers during drought were made and incorporated into the research models. Those assumptions are specified in Chapter III.

Historically, there has been only one instance of direct purchases of beef by the government to provide assistance in time of disaster. In May 1933 the Congress passed the first Agricultural Adjustment Act. One purpose of this act was to assist ranchers by raising prices.[3] Because of a large national supply of cattle in combination with reduced demand for beef and little available pasture due to the drought, the federal government began to buy beef through the Federal Surplus Relief Corporation on November 10, 1933. In South Dakota the federal government purchased 42% of the state's cattle, 915,039 head from 67,000 farms.[4] The average price was $10 per head with a maximum allowance of $20 per head for healthy animals.[5]

Since 1933 there have been numerous legislative acts and farm programs that have assisted South Dakota cattle producers. Several of the most financially important of these with regard to emergency assistance will be cited.

In 1933 the Farm Credit Administration was set up to supply feed loans through newly-created Federal Land Banks, Intermediate Credit Banks and Production Credit Corporations.[6] The Taylor Grazing Act of 1934 opened 143 million acres of public domain to grazing at $.05 per head per month.[7] The Soil Conservation and Domestic Allotment Act of 1936 paid cattlemen for developing water

resources and other conservation measures.[8] The Farm Security Administration, established in 1937, reorganized the rural relief and rehabilitation programs previously administered by the Resettlement Administration.[9]

South Dakota cattle producers have never again suffered a long-term economic disaster like that which befell them in the 1930's. However, since 1940 there have been several significant changes and expansions of government assistance to cattle producers. Three of the most noteworthy were Farmers Home Administration (FmHA) emergency assistance, the national school lunch program and the national food stamp program.

In 1946 the FmHA was created to succeed the Farm Security Administration. The FmHA took over the work of the Farm Credit Administration in 1949 and has since served as the chief federal agency for dispersal of emergency credit to cattle producers during natural emergencies.[10] The blizzard of 1948 - 1949, the drought relief of 1953 - 1954 and 1975 - 1977 are some examples when the FmHA took action to extend emergency credit.

Also in 1946 the National School Lunch Act established lunch programs "to safeguard the health and well-being of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities. . .".[11]

Under the provisions of this act government purchases of beef to be fed to children through lunch programs began that have continued to the present day. These purchases have provided a source of market expansion for cattle producers.

The Food Stamp Act of 1964 authorized an assistance program for low-income households.[12] This program sought to improve nutritional standards of low-income families by supplementing their food purchasing power. Beef purchases to meet the increased demand also served to expand the market for cattle producers.

Apart from federal programs to improve beef markets, many South Dakota cattle producers have received government assistance for feed crops they plant to supply feed for their cattle during winter months. Government assistance furnished by such programs as price supports, crop disaster payments for wheat and other feed grains, and crop insurance to reduce income variability have helped cattle producers during emergencies.

Price supports are placed on such basic crops as corn, wheat, cotton, rice and peanuts.[13] The price support on corn assists the cattle producer who produces corn by providing an alternative market for his corn crop if he is forced to sell all or part of his cattle,

or if he produces more corn than is needed for feed. The price supports guarantee that a market will exist at the minimum specified price support level.

Crop disaster payments reimburse the producer for wheat or other feed grain crops, if due to natural disaster he can plant no such crop or harvest only a small portion of his crop.[14] This aids the cattle producer who also produces feed crops by guaranteeing some payment to replace the wheat or other feed grain crop he lost when his crop failed.

Crop insurance reimburses the producer for losses from all natural hazards - such as drought, freeze, excessive moisture, insects and disease.[15] Coverage is limited by law to the cost of producing the crop in the area. This program aids the cattle producer by reducing the variability and range of income from crop production.

The drought assistance programs which have been made available during the drought of 1975 - 77 include emergency credit, cattle and feed transportation assistance, the emergency feed program and the crop disaster payment program.

The FmHA administers several types of emergency credit loans. For example, low-interest intermediate loans are available for crop losses. The most important

emergency loan for cattle producers administered by the FmHA was established by the Livestock Credit Act of 1974 and its amendments.[16] Through this act the federal government guarantees livestock loans made by other lending agencies up to 90% of loss with a limit of $375,000 (subject to other need limitations). Loans under the 1974 Act are available until September 30, 1978.

The Farmer-To-Consumer Direct Marketing Act of 1976 provides subsidies for transporting hay and silage to counties designated as drought disaster areas.[17] The hay subsidy pays 80% (not to exceed $50 per ton) of the cost of transporting hay. The silage subsidy pays $12.50 per ton for transporting silage. The Cattle Transportation Assistance Program subsidizes cattle producers for two-thirds of the cost (not to exceed $24 per head) of transporting cattle from drought designated areas.[18]

The Emergency Feed Program provides assistance in purchasing feed to maintain foundation beef cow herds and their replacements.[19] It furnishes up to 50% of the cost of the feed purchased, but not to exceed two cents per pound of feed grain equivalent. No payment can be given on feed loss which has been claimed under other federal programs.

The Crop Disaster Payment Program, as noted earlier,

provides reimbursement to crop producers for loss of wheat or other feed grain (corn, barley and sorghum) due to natural disaster.[20] The assistance supplies payment if no crop has been planted or if less than 50% of expected production is harvested.

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